AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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A Machine Tool Builder's System of Working Drawings.

In the construction of machinery, the first requisite is correct drawings from which to work. So well is this understood at the present time that in the best machine shops some system of working drawings is adopted—presumably the one best suited to the purpose—which is rigidly adhered to in their practice. That thousands of dollars are saved every year by this plan does not admit of question.

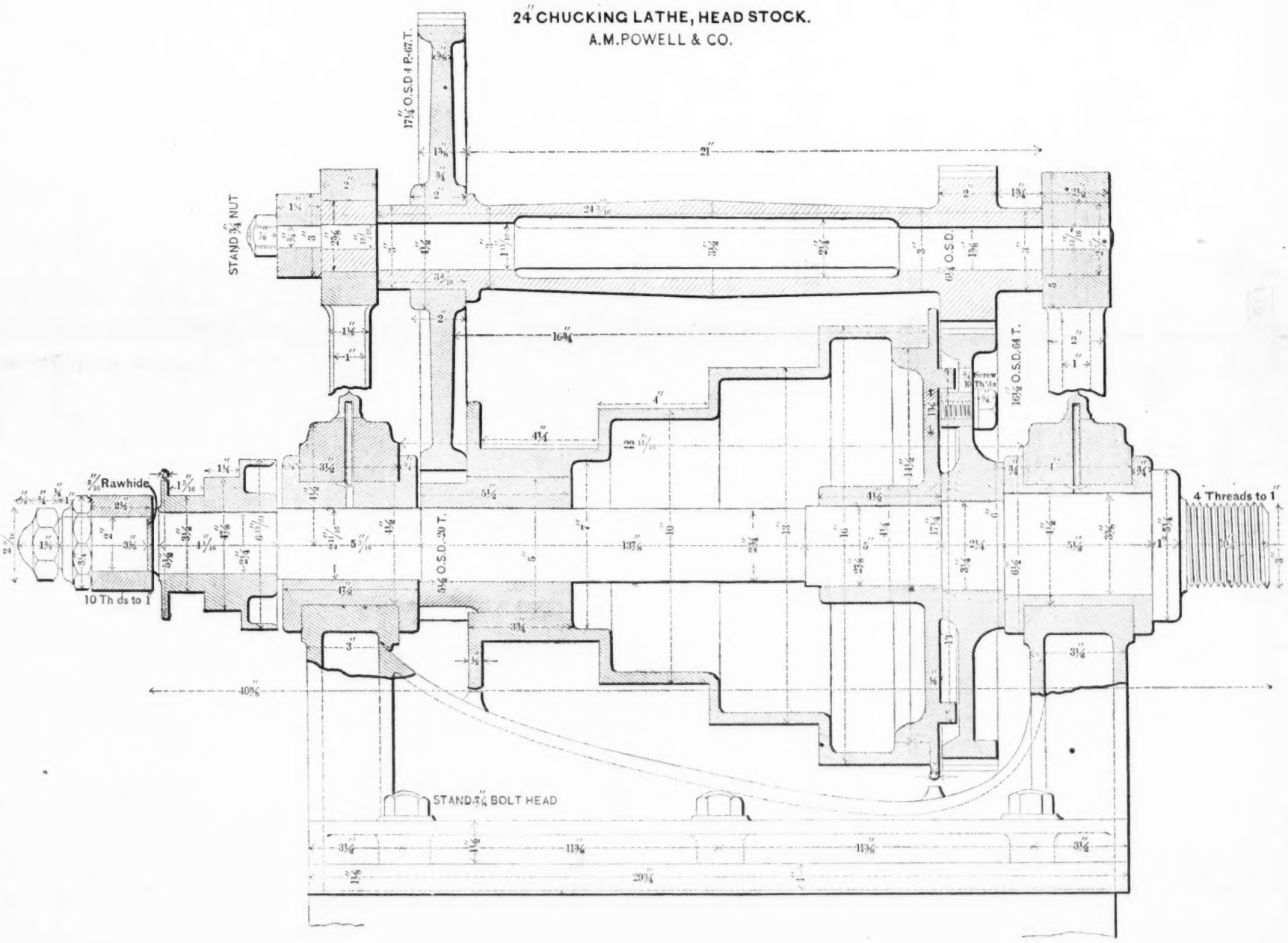
We have always endeavored to impress upon the younger readers of the AMERICAN MACHINIST the importance of devoting considerable time to the study of mechanical drawing. It is not only of importance to understand mechanical drawing in the event of being called upon to fill some other position than that of workmen at their trade, but to read drawings properly it is advisable to know how to make them, for which reason alone every mechanic should be able to make drawings.

The general subject of mechanical drawing for industrial purposes comprehends not only the delineation of the details of machines and machinery, but also the best arrangement of these details to embrace a system convenient for use in the shop. In our present issue we have devoted considerable space to the reproduction from the original blue prints of a subject which illustrates the system of working drawings in use at the machine tool works of A. M. Powell & Co., of Worcester, Mass., the blue prints having been kindly furnished us by that firm for the purpose. We have chosen the subject because it serves to illustrate the system to our readers who are interested in such matters, and especially because it furnishes to the apprentice and young mechanic a varied example for practice seldom found in an equivalent space. On page 1 an engraving from the blue print is represented, the original being reduced in size by photographing, but the general arrangement of the parts on the sheet is preserved for reference, while the forms are presented for reproduction. On page 3 a similar reduction is made, while on page 2 the sheet of details is reproduced full size, representing exactly what is used as a working drawing in the shop. The engraver has, however, made one mistake which we particularly caution those who study the subject as a lesson in drawing *not* to make. In representing fractional dimensions he has used diagonal lines between the numerator and denominator. Such dimensions should always be represented with the numerator immediately over the denominator, separated by a horizontal line, more especially when used in connection with a whole number, as serious mistakes have sometimes been made in reading mixed numbers on drawings when this plan was not followed. If the rule is established of always writing fractions in this way, they will not be carelessly written in places where mistakes may occur from their use. This may appear a small matter to note, but it is one of those things that are of considerable importance in mechanical drawing.

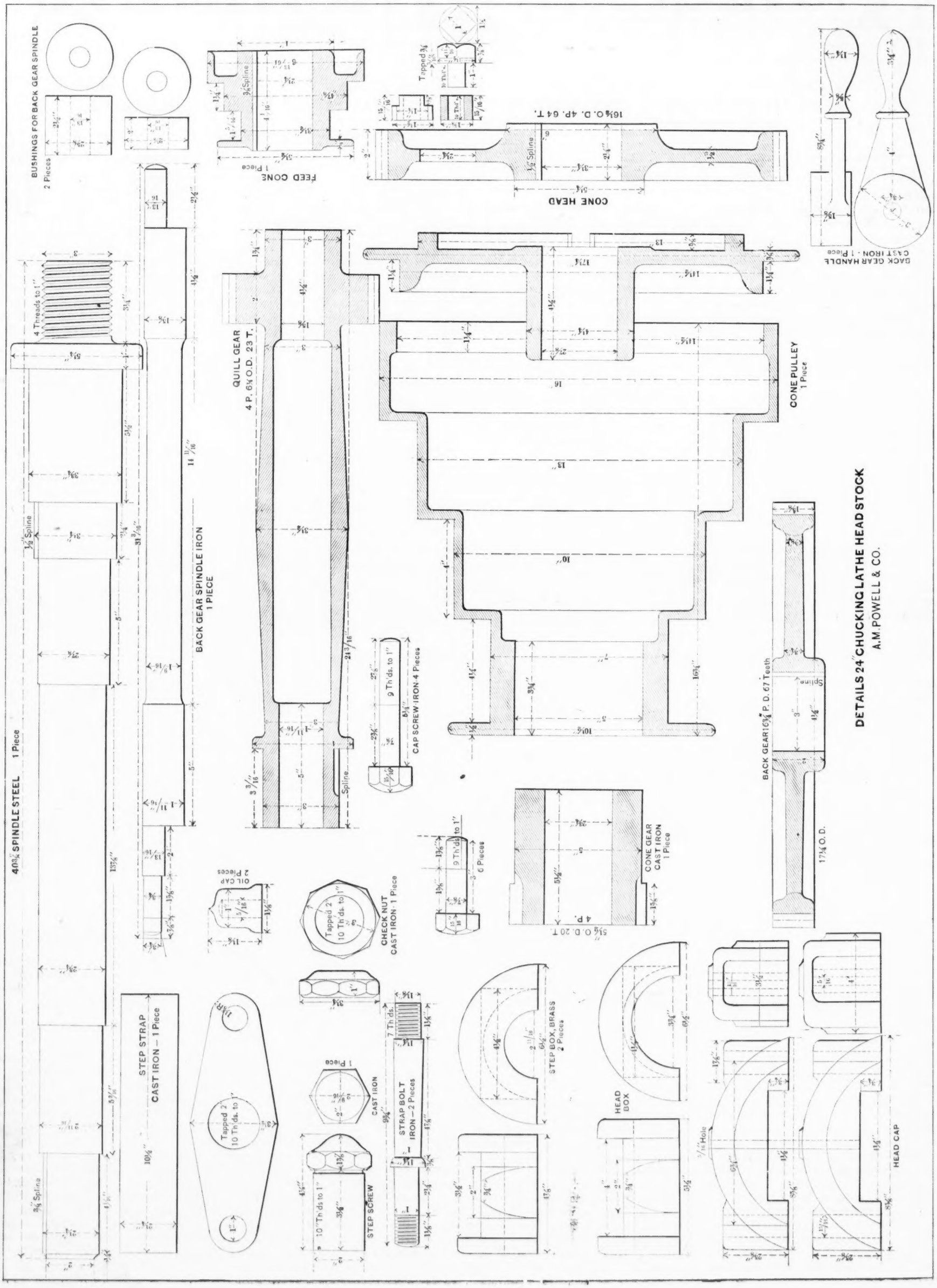
In reproducing these drawings, it is not essential that it be done on the scale as here shown. The scale can be enlarged at first, and afterwards made the same, or less if desired. It is also quite proper for the learner to improve on the arrangement of the parts on the sheet, if he sees ways to do so. Before trying to do this, however, the reason for the present arrangement should be closely studied. The plan of carefully marking dimensions, so as to leave nothing of importance to be determined by measurement should be rigidly adhered to. The examples given furnish abundant room for thought as to the whys and wherefores of machine construction, as well as examples in detail drawing and the arrangement in sheets. Of their system, A. M. Powell & Co. write as follows:

"We first make our drawings in pencil upon Manila paper, showing all views full finished size, giving amount of finish necessary for the pattern maker. From these preliminary drawings patterns are made, and one complete machine built, noting all discrepancies of finish figures that may be found; also what improvements can be made from experience found in building this machine. This drawing is given one coat of white shellac, and is given into the draughtsman's hands to make complete detailed working drawings. These detailed drawings are made upon cards of uniform size, 10″ by 13½″.

"We make sectional elevations of the dif-



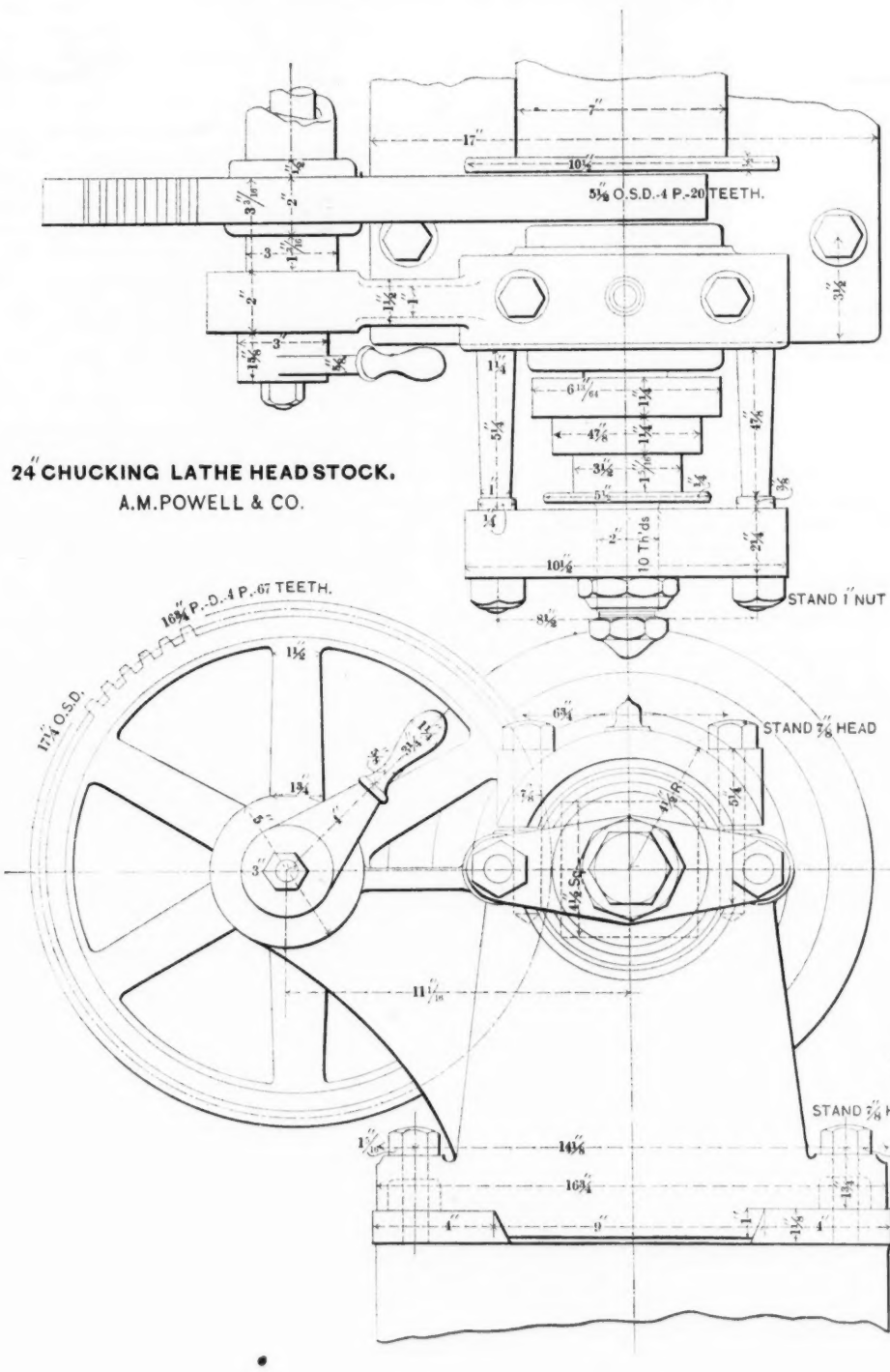
ferent parts of the machine like the engravings you have made—for use in setting up, and also sheets showing complete details of machines, giving the different views necessary to show the workman what the part is, and how it is to be made. These parts are numbered to correspond with the number on the sectional drawing. Each drawing of castings is numbered to correspond with the number in the casting-book from which orders to the foundry are given for castings. These sheets, when finished, are given one coat of white shellac, their dimensions are put on and tracings taken from them, and blue prints made. The cards are stored away in the drawing-room for reference.



The blue prints are mounted on cards of uniform size, and distributed in the shop for use.

"One set of the blue prints for each machine are bound together, with pieces of blank paper of the same size, for use in the office. On these blank pieces of paper we note all changes that may be made by experience or conversations with customers; memorandums of machines sold, to whom sold, opinions expressed upon them, in fact everything we may consider to be of value to us in our business. The designing of machinery and the drawing-room are under the personal supervision of Mr. Powell."

No further explanation of the drawings appears to be necessary, except it may be (for the benefit of those beginning the study of drawing) the signification of some of the letters used. Of these *O, S, D,* or *O, D* stand for outside diameter; *P, D* for pitch diameter; *P,* for pitch, and *T* for teeth. Similarly, *Stand.* is an abbreviation of standard, and when used to describe a bolt head signifies that it is of standard dimensions. When descriptive of a nut it signifies that it is of standard dimensions, including pitch of thread.



24" CHUCKING LATHE HEAD STOCK.
A.M. POWELL & CO.

Difficulties with Steam Meters.

A discussion of this very interesting subject occurred at the last regular meeting of the Polytechnic Association at Cooper Institute, New York City, December 21, 1882. It was manifest that the persons taking part in the discussion fully realized the numerous and exceedingly difficult obstacles to be overcome before steam could be accurately measured.

It was suggested that the quantity of steam used might be determined by measuring the water of condensation. This was objected to on the ground that the water of condensation furnished no clue to the actual quantity of steam used, for the so called steam might have contained much water when it passed through the engines. The fact that a boiler gets away with large quantities of water is no indication of its efficiency in furnishing dry steam, and to measure the products of such a boiler, the steam and water together, would be very unjust to the consumer. In some parts of this country where steam is supplied to the consumer from pipes laid in the streets, they ascertain what were the average coal bills, then agree to furnish an equivalent amount of steam at the same price. In other places when steam is to be furnished to drive engines and other machinery, an indicator is applied to each engine and the actual power ascertained, for which the user is charged accordingly. Both of the methods described are only approximations, and owing to the constantly varying conditions are as likely to overrun the actual quantity of steam used as to be under it. In one of our Western cities an apparatus, something after the principle of a gas meter, has just been brought out for measuring steam.

The principal feature about this apparatus is the reducing of the pressure uniformly to 60 pounds per square inch in passing through the meter. It was admitted, in the course of the discussion, that such a proceedure would be objectionable, as the advantages to be gained by using steam at high pressures would not then be realized.

It was argued that steam in passing through such an apparatus would be rapidly deprived of a portion of its pressure which would impart additional heat to the steam, or in other words superheat it to some extent. Steam, under such conditions, would have a higher temperature, in proportion to its pressure, than steam furnished directly from a boiler at the same pressure.

The wire-drawn steam would, therefore, have some advantages, but these advantages would not make up for the losses incurred through a reduction of the pressure.

An inquiry was made as to how steam could be accurately measured when it had been found so very difficult to measure air and illuminating gas, particularly the latter.

These fluids do not materially change except through expansion and contraction, so that one would suppose that they might be accurately measured. Several persons present declared that some of the most serious errors were habitually made in the measurement of gas. We often hear the expression in reference to untruthful persons, that "They lie like a gas meter."

It was generally concluded that steam could only be measured with any degree of accuracy by creating and maintaining uniform conditions; such conditions as correspond with the actual every-day practice in each particular case under investigation.

It is said that the amount of money sent by the working people in Fall River to people in their native countries is vastly larger than persons not conversant with the facts have any idea. A large number of the operatives are thrifty and frugal, and are constantly hoarding up such little sums as they are able to spare, and are either putting them in the savings banks or sending home to relatives. The French Canadians, many of them, prefer to send their money to Canada for deposit, apparently having more confidence in banking there than here. There are two families of French people in Fall River, apparently of the poorest class. They consist of the heads, respectively, of the families, and six daughters and one son in one, and seven sons and one daughter in the other. They have all been employed in the Pocasset mill until recently, and are now working at the Mechanics, in the spinning and weaving rooms. A short time ago one family received an acknowledgment of a draft from a bank in Quebec of the receipt of $1,200. Last week the other family received a similar acknowledgment for $1,500. All this money had been saved from the combined earnings of considerably less than a year's time.—*Manufacturers' Gazette.*

Formerly the cotton-mill operatives of Fall River not only furnished the labor, but a large share of the capital employed. The directors of the mill corporations were, many of them, directors of the bank where the operatives deposited their savings. The operatives also were formerly accustomed to buy stock of the mill companies with a portion of their savings. When a defalcation occurred and a mill company suspended, some bank was likely to suspend and the losses would fall upon the operatives. The working people of Fall River have probably wasted enough money in resisting reductions of wages to build and equip several co-operative cotton mills where they could employ themselves.

Judging by the Fracture.

(From The Mechanical World.)

Whenever a line of shafting breaks, a boiler explodes, or a rod or link snaps, an examination of the fractured surface of the iron is made. The inferences drawn from the examination are sometimes very unfair to the maker, at other times to the consumer; although the examiner himself would do no injustice to either. These unjust conclusions may frequently be ascribed to the prevalence of crude notions concerning the appearance which the fracture should present. Many suppose that if it is not fibrous, but crystalline, then the metal was unfit for use, and they charge the foreman or engineer with having subjected it to injurious and unnecessary strains which rendered it worthless at the time of the accident; or they charge the maker with having furnished metal of so poor a quality that it was unable to stand customary wear and tear. These charges are grave; they injuriously affect professional character, and they should be made with extreme caution, for the conditions under which iron may assume and maintain a fibrous or a crystalline structure are yet matters of profound scientific inquiry. For a long time they have engaged the attention of the best engineers, who, recognizing the difficulties involved in the question, have been slow to form and to utter positive convictions.

The appearances of fractures being due to the positions assumed by the molecules of iron at the places when the metal is fluid, any change in their position may be accounted for. Thus, when pouring molten metal into a mould, that which chills rapidly will, when broken, exhibit a different fracture from the rest. It will be crystalline and lustrous, indicating hardness and brittleness; while parts of the same casting which cooled slowly will exhibit a dull granular fracture, and be found comparatively soft and tough. Here the fluidity of the mass readily permitted its molecules so to arrange themselves under the varied conditions of temperature as to impart to it the different qualities.

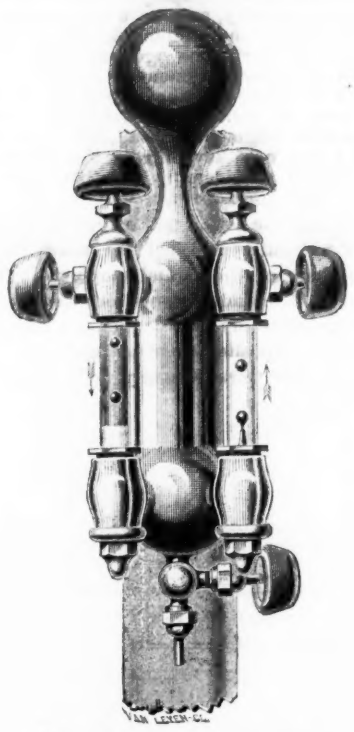
When the iron of which good shafting, boiler plate, rods or links are made leaves the fashioning, it is of uniform quality. It remains solid while in use, and any molecular changes must be attended with difficulty, and be produced only by powerful external agencies. The opinion that the severe cold of our winters changes fibrous iron into crystalline, although generally entertained outside the profession, is received by engineers with many grains of allowance, and some of the best of them reject it altogether. Indeed, they have great reason to doubt whether iron, as it comes from the rolls or the hammer in the form of bar, plate, or rod, has a fibrous structure. Take the rod to the draw-bench, and draw it into wire in the usual way. You impart to it a fibrous structure; and so do all machines for testing tensile strain. The best pieces when drawn asunder exhibit fibrous structure, and this is assumed to show that they possessed such structure before they were subjected to the strain; but it proves nothing of the kind. As in wire drawing, the tendency of the operation is to cause the molecules to take the form of fiber; but had another method of rupture been employed, the same pieces would have appeared crystalline, and by the popular standard been adjudged inferior. Nick them round, as is frequently done in the rolling mill, and, laying them flat between two supports, subject them to the force of a falling weight. They will break squarely off, and not a trace of fiber can be detected in the fracture. Had the same bars been tested in another familiar way, by making a nick on one side only, and then with a hammer bending them until they broke, the fracture would have been fibrous, the bending being so far a wire-drawing process as to arrange the molecules in fine lines. Whether the fracture be fibrous or not depends upon how the rupture came about, and to condemn iron because its fracture is crystalline, without taking into account the method of rupture, is most reprehensible. Poor iron is so because it is impure. One per cent. of carbon, silicon, sulphur, or phosphorus seriously impairs the quality of iron, and the presence or absence of those elements can be ascertained with the greatest nicety by means of chemical analysis.—*Dr. A. S. Kennedy.*

New Double-Sight Feed Cylinder Lubricator.

We present with this an engraving of the new cylinder lubricator, recently brought out by the American Lubricator Company, of Detroit, Mich. It belongs to the class in which the oil is regularly fed to the cylinder through the steam pipe, the feed being regulated to supply the exact amount required for perfect lubrication.

This lubricator requires but one connection to the steam pipe. Through the part that screws into the pipe, to make this connection, are two passages or small holes. Through one of these passages steam enters the condenser at the top of the lubricator, where it condenses, filling the latter with water. This water is regulated to pass into the left-hand tube in the engraving, the number of drops per minute indicating the rate at which the cup is feeding. This water, by its superior gravity, displaces an equivalent amount of oil, which passes up through the water in the right-hand tube, and so on and through the second passage in the part that is screwed into the steam pipe to the cylinder.

The cup is neat in appearance, and is especially designed, with rounded corners and sections, to prevent the nickel plating from rubbing off.



DOUBLE-SIGHT LUBRICATOR.

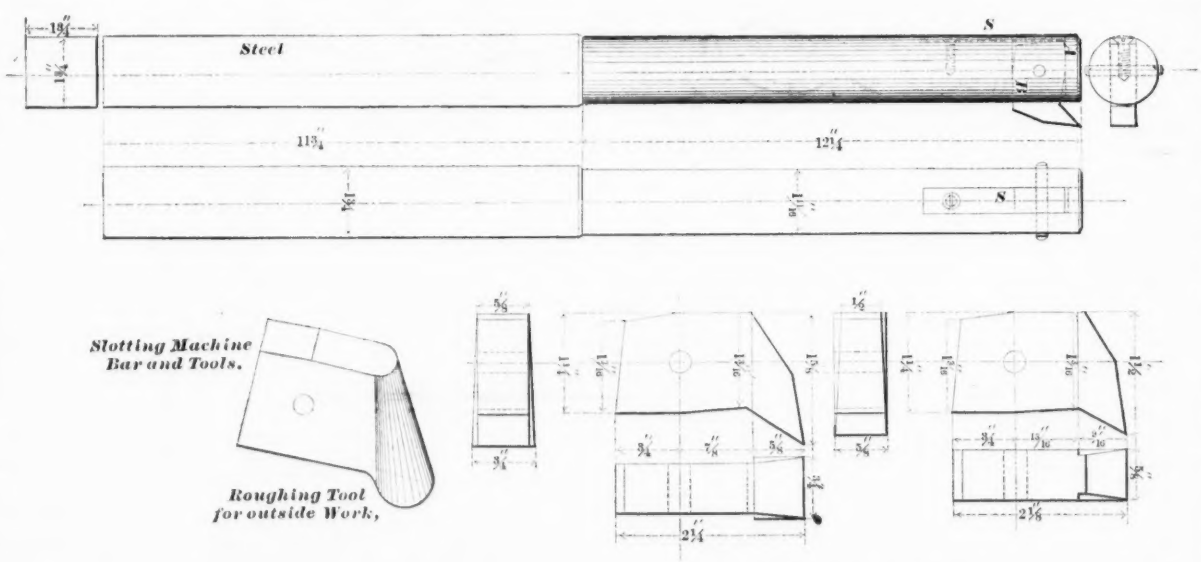
Cutter Bar and Cutters for Slotting Machine.

The accompanying engraving represents a standard bar and tools for a slotting machine, as manufactured by R Chestnut, 135 West First street, Oswego, N. Y. The bar is made of steel, and is round for a distance from the end a little more than equal to the stroke of the machine, while the shank is square in section. The cutter is held in position in the slot by means of a pin, as clearly shown. The slot admits of a slight rotating motion of the tool around the pin.

In cutting, the tool is brought in contact with the top and bottom of the slot at *A* and *B*, thereby relieving the pin from the strain of the cutter. After the cutting stroke is completed, the spring *S* operates to swing the point of the tool away from the cut sufficiently to permit the up-stroke to be made without dragging the cutting edge of the tool sufficiently hard to injure it.

The shape of the cutters is such as to permit free cutting, and, being small, they can, without heavy expense, be made of a fine quality of steel, thus insuring the best results as to cutting and durability.

The bar, of course, is practically indestructible, and the cutting tools being properly constructed and adjusted to it, are always in the proper position to cut. The cutters are made of standard size, and hence will correspond to standard key-ways, as cut in shafting, &c. Changes of cutters are very readily made by driving out the pin, removing one cutter and substituting the one required. These bars are made of any size required, the one shown being designed for a 12-inch stroke.



⅝″ and ¾″ Keyseating Tools.

Barrels have for some time been made of pulp, but with the heads separate, and held in place by hoops. By a recent invention, according to the *Cleveland Leader*, Mark L. Deering, of that city, makes the entire barrel in one piece, and without hoops. The wood pulp is placed inside an iron cylinder, which is caused to revolve in a direction around the axis of the barrel, and also in a direction at right angles to the axis. This distributes the material, when air, at a pressure of 100 pounds, is admitted, forcing the water out through small holes provided for the purpose. Drying completes the barrel.

Locomotives of 1882.

BY WILLIAM BARNET LEVAN.

The past year, like the former, has been a harvest for locomotive builders, all of them being taxed to their full capacity, and the end of the year finds them still with large orders unfilled.

Philadelphia is, indeed, the metropolis of American locomotive-building, and the Baldwin Locomotive Works has turned out 560 locomotives during 1882, and their order-book shows a large number unfilled.

In reviewing the progress that has been made in improving the locomotive, there is but little to write about.

The locomotive builders have all that their employes can do to fill their orders, regardless of any improvements that may suggest themselves, either in the direction of economical working or an increase of speed. As these improvements do not add anything to the profits of the builders, consequently, as long as they have plenty of orders at paying prices, they will not trouble themselves about improvements, which would require an extra outlay for tools, etc., that would not promise a remunerative profit in return.

Within the last few years higher speeds have been called for, which means increased consumption of fuel, unless some radical change is made in the valve arrangement of our locomotives. To accomplish this we must also increase our initial steam pressure in the cylinder, and maintain it without expansion up to the point of cut-off, and reduce the back pressure.

What the traveling community want is greater speed, as long as it can be had with safety. The time is not far distant when passenger trains will be required to run at sixty miles an hour as soon as our roads are in a condition fit for such speeds, as they eventually must be. To maintain such speeds with trains of four or five cars, even over a nearly perfect road, we must reduce the increasing weight, particularly the dead weight.

It is notorious that the greatest part of the work done by locomotives upon railroads is applied to hauling dead or nonpaying weight, and this defect in railroading is not mended by drawing a couple of passenger cars with a locomotive weighing thirty tons, nor by putting two passenger locomotives on a freight train.

To accomplish high speeds with our locomotives, we must increase the evaporative power of our boilers, in which we are limited by the width of our track; therefore, it behooves us to increase our boiler and initial steam pressure in the cylinder, and reduce the back pressure due to contracting of the exhaust nozzles. Independent cut-off valves will also be required. Independent cut-off valves are not new in locomotives, having been used many years back (1849–'50) with great success both in this and other countries, and were found to be very efficient. Unfortunately, in this country these improvements were in advance of their time, on account of their additional expense and the small amount of capital then at the command of the railroad companies, but the time is not far distant when a first-class locomotive without an independent cut-off will be the exception and not the rule.

Railroad superintendents have been looking towards wrong sources for improvements; they shut their eyes to the teachings of the stationary steam engine builders in their improved practice, dismiss mechanical engineering talent, and wait for patentees and speculators, hoping, like Micawber, that "something will turn up." They look for some wonderful discovery to relieve them from the responsibility of thinking and acting for themselves, instead of taking that which can be had for the asking.

Higher boiler pressures are needed, the economy of which is beyond all doubt; moreover, high steam generally means *dry steam*, the importance of which cannot be over-estimated. It is well known by engine drivers that *water* has no effect in propelling the piston, to say nothing of the positive danger of its presence, in the cylinder. The higher the pressure carried, the more work is made available in proportion to the total amount of heat expended.

A combustion chamber in connection with the fire-box is also wanted, so as to afford what chemistry and practice have shown to be necessary—time and room for the complete development of flame, before its extinction by the flues—the latter being only conduits of heated gases.

The most important of all improvements for complete success in locomotive economy is an independent cut-off valve.

Let any superintendent stipulate that he must have a locomotive which will run 50 miles an hour, hauling a train consisting of four first-class passenger cars loaded, and the coal consumption must not exceed 30 pounds of fuel per train mile on a road bed equal to the Bound Brook or Pennsylvania railroad companies' roads. These conditions being complied with, he will order 25 locomotives more at a reasonable advance over a fair price as now paid. I am satisfied he will have any amount of offers on such terms.

The world's stock of locomotives consists of 66,000. The United States is credited with 20,000 passenger and freight locomotives, their total annual mileage being about 400,000,000 miles. The average cost of fuel at ten cents a mile would be $40,000,000. A saving of only two cents a mile in fuel would reduce this sum $8,000,000.

It seems from past experience, that no improvement or plan is considered worth while to act upon unless it be the subject of some patent. Yet the experiments with patent spark arresters, smoke-box extensions, heaters, blow-back valves, and the Fontaine locomotive, have proved them nearly all worthless. If we only look back we shall see the columns of argument published, as well as the prejudice and hostility that have been thrown in the way of the introduction of coal-burning locomotives, outside cylinders, link motion, etc. But these objections were successfully met as well as other corresponding improvements all common to public use.

When once accepted, the self-sufficiency which usually attends rigid conservation has often been manifested, as each and every one took credit to himself for adopting such improvement in advance of others.

Yet the future appears encouraging and there is evidently an intelligent spirit of reform already at work. It is heard upon all sides that we must have better superstructures and road-beds, also improved valve gear; furthermore, we *must* burn liquid fuel from the fact that oil is comparatively cheap and coal dear.

One great advantage in the use of mineral oils is that they contain a higher percentage of hydrogen (hydrogen free .15 carbon free .84) than other fuels, and although their use for steam-generating purposes is not well established as yet, the results obtained are very promising, and the use of this kind of fuel will, in all probability, become extensive.

Facts are the foundation of all science; and they outweigh the profoundest and most ingenious speculation.

In the use of an independent cut-off Mr. A. J. Stevens, General Master Mechanic of the Central Pacific Railroad at Sacramento, Cal., has taken the initial step toward making the locomotive as it should be by adopting independent cut-off valves in a twelve-wheeled freight locomotive 19″×30″ cylinders. He writes, "This engine is at work on a grade of 116 feet per mile, with ten degree curves, one right after the other, as closely as they can be laid. The engine has hauled up this grade (25 miles in length) a train of 14 freight cars loaded with 20 tons (2,000 pounds to the car). This would be a total load of about 210 tons, not including the weight of engine and tender. This would be a heavy load for two of our largest ten-wheeled locomotives with 18″×24″ inch cylinders and weighing 40 tons."

Although Mr. Stevens says, "You will observe we have taken what some people will consider a step backward in regard to the arrangement of the valve gear. I am satisfied it is the proper valve gearing for freight engines."

The working of this locomotive has been so satisfactory that the company has ordered twenty-five more of the same kind, and at

the present writing three of this order are ready for use.

I fully agree with Mr. Stevens. It is the proper valve gear for both freight and fast passenger service, and it will win. Combine this with high boiler pressures, and a properly constructed combustion chamber and the "day is ours."

The Shaw Locomotive is also another step in the right direction, if they can demonstrate all that is claimed for this engine, to wit: counterbalancing all reciprocating weights; doing away with sinuous motion (this the writer is satisfied has been accomplished) and hammer blows upon the rail.

In the use of liquid fuel it is claimed that a decided step has been taken in the Holland locomotive boiler, by generating hydrogen gas as required, from oil and steam. The process used is simple, giving clean, quick and intensely hot fire, being entirely under control of the engineer, *free from all sparks, smoke, gases or cinders.*

If the above can be demonstrated beyond doubt, there are also other great advantages to be obtained from the use of hydrogen gas. It is well known to engineers that the best merchantable coal used under boilers, with the most approved appliances of grates, combustion chamber and air admission, produces only about 10,000 units of heat, whereas hydrogen gas will produce, under the same circumstances, 60,000 units of heat—again in favor of the use of the latter of 83.33 per cent.

$$\frac{(60{,}000-10{,}000)\times 100}{60{,}000}=83.33 \text{ per cent.}$$

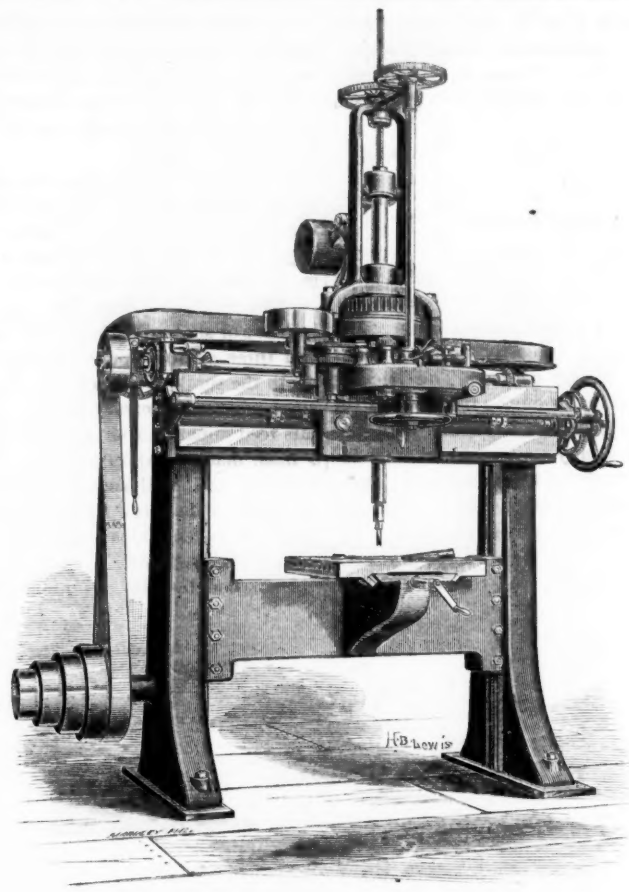
or, in other words, one pound of good average coal will only evaporate 10 pounds of water from 212 degrees, whereas one pound of hydrogen gas will evaporate 60 pounds.

Another advantage in the use of liquid fuel is that it has a definite temperature of ignition, which is, moreover, very low in the scale, and hence produces its heating effect through a very long range. The heating effect commences at once upon ignition.

I predict that the day is not far distant when locomotive boiler pressures will be common at 200 pounds per square inch, and independent cut-off valves will be in general use. The results will be that the consumption of fuel per train mile will not exceed 25 pounds, in place of 50 pounds, as now used in our fast express locomotives.

Sellers' Traverse Drill with Cotter-Drill Attachment.

This machine, illustrated herewith, is designed by its originators, Wm. Sellers & Co., of Philadelphia, to be a superior drill press and a Cotter drilling machine, and is expected to fully meet all the requirements of the latter tool, without in the slightest degree impairing its efficiency as a drill press. The amount of cotter or slot drilling to be done in any one establishment seldom warrants the purchase of a tool for that purpose alone, or when such tool is a necessity it remains idle some portion of the time for want of work. The machine is arranged to permit pieces fifty inches wide to pass between the uprights which carry the cross-head of the machine, and as the center of the spindle is ten inches from the face of the posts, it will drill or cotter plates ten inches from the edge, no matter what may be the length of the plate. It will key-seat shafts lengthwise which are 20 inches in diameter. The side traverse of the spindle on the cross-head is three feet, and as the table of the machine has a motion at right angles to the motion of the cross-head slide of two feet, the space covered by the drill at any one clamping is 36″x24″; that is to say, holes may be drilled anywhere within the space of three feet by two feet. The table is raised or lowered by power. When used as a traverse drill, the spindle is adjusted to position sidewise by hand, using the same screw that gives side motion to the spindle in slot-drilling. The change of the machine from its functions as a drill press, pure and simple, to a Cotter drilling machine is the work of a moment only, and involves no complication. Two eccentrics thrown over by levers, and one gear wheel shifted into



SELLERS' TRAVERSE AND COTTER DRILL.

gear with two others constitute all that is required, and when the Cotter drilling mechanism is not in use all its motions can be stopped, so that the cottering mechanism is not subjected to any wear at such times.

When drilling slots, the motion sidewise, obtained from the screw in the cross-head, is a perfectly uniform one and its limit of motion is defined with accuracy. The drill is fed down at each end of the side stroke, the motion at the spindle sidewise stopping during the down feed, and the amount of feed is adjusted by the well-known Sellers' feed discs.

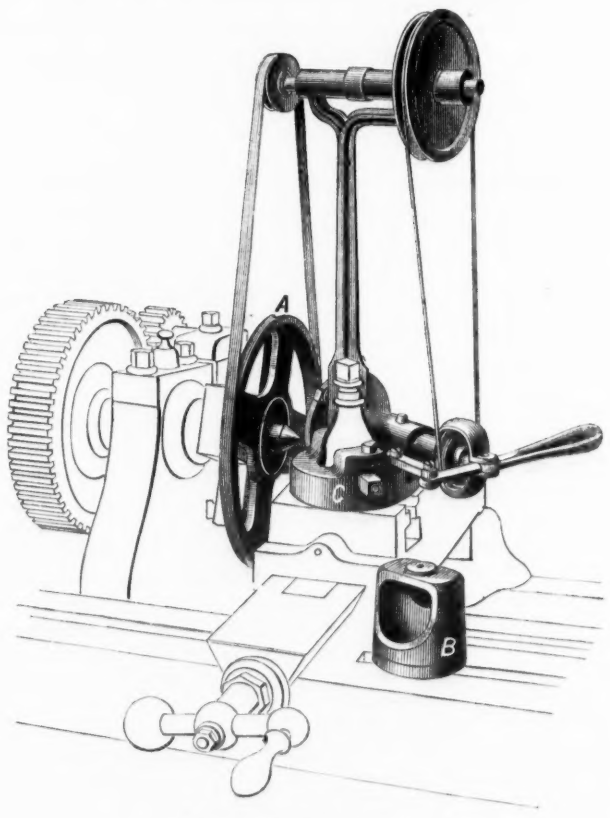
It will be observed that the drill spindle obtains its motion from a belt driving directly on a pulley on the sleeve which carries the drill spindle. Back gearing, after the manner of a lathe, is also provided for use when the size of the hole to be drilled requires the additional power

The makers claim for their belt-driven spindles a smoother motion than can be obtained by the use of gearing, and they say that they use the machine without the back gear for holes in cast iron as large as one and a half inches in diameter.

Some recent experiments made by them with drilling machines, in all respects similar to the one here represented, save that one was geared to drive the spindle and the other was with spindle driven by belt, showed an advantage fully equal to 15 per cent. in favor of the belt-driven spindles. We are informed that all their single spindle drill presses, whether vertical or horizontal, have been arranged to belt directly to the spindle in the manner substantially as shown on the machine here illustrated.

Much of the mechanism on this tool is common to their other drill presses, stationary and radial. The spindles are all well counterbalanced; they are provided with a quick hand motion and an adjustable power feed, and the spindles extend through the driving sleeves, and have the same length of bearing for all positions of the spindle.

The makers, William Sellers & Co, claim for the vertical-spindle cottering drill, that in wrought iron and steel the possible use of oil in the slot being drilled, makes that position preferable to the horizontal spindle for the same purpose.



LATHE CENTER GRINDER.

New Center Grinder.

The necessity of having the live center of a lathe on which fine work is done run absolutely true, is as well known as the fact that a center turned, removed, hardened, and replaced will seldom or never be exactly true. The engraving which accompanies this represents a device for truing centers after they have been hardened and replaced, as well as for keeping hardened centers trued up without the necessity of drawing the temper.

The device consists of a small emery-wheel, suitably mounted to receive motion from the lathe. In using this, the driving-wheel *A* is placed against the face-plate and temporarily held in position by the dead center against the cup-piece *B*, and finally secured by two bolts. The principal casting, *C*, is then set over the tool-post and held by a bar through the slot; then by arranging the casting in line with the lathe the usual angle of 60° may be ground.

The driving is done from the pulley *A*, through the countershaft shown, the lathe being run as in turning. The wheel is brought into position to cut by the feed-screw of the tool-post, and traversed on cutting line by means of the hand lever seen in the engraving at the right hand. This center grinder is simple, quickly set, and from its appearance would seem to be effective. It is manufactured by Trump Bros. Machine Co., Wilmington, Del.

LETTERS FROM PRACTICAL MEN.

Cutting Steel with a Wet Metallic Disk.

Editor American Machinist:

Your valuable paper comes to me regularly every week, and every time it comes I get useful information. I am now building a very large pulp engine for the Chemical Pulp Co., of this place. The fly bars are made of homogeneous steel 4″ wide and ⅝″ thick, each requiring a slot at both ends 2¼″ deep and 1″ wide. All this is not new, but how I made the slot may be of interest to at least some of your readers.

I did as follows: First, I drilled an inch hole 2¼″ from the end, I then took out my emery wheel and put in its place a disk 12″ diameter, No. 14 sheet iron (scant ⅛″ thick), I also made a table with a gauge to rest the fly bars upon, with a lever at back end to press the bars to be slotted against the revolving disk. I made two slots at each end with wheel, cutting to the hole. I cut them at the rate of a trifle over 4″ per minute (made 18 cuts in ten minutes); I also found that when I run the edge of the disk in water it cut twice as fast as when I run it dry.

The motion of the disk was 2,800 revolutions. I think a higher speed would have done quicker work, but I could not speed it any higher without making changes in my pulleys, which I did not care to do as it worked very satisfactorily as it was.

GEO. E. STAUFFER.

East Stroudsburg, Pa.

Lathe Spindles, Bearings and Centers.

Editor American Machinist:

Upon your invitation to discuss new designs and improvements in machine tools, several have responded on the subject of engine lathes, and I would like to add a few observations on the same subject.

Well knowing that there are many opinions afloat upon the different styles and proportions of lathes, I will not claim for my ideas perfection, but will give them to the readers of your valuable paper, merely as *my* conception of the best design for a lathe doing many classes of work.

Your correspondent, Mr. Smith, I consider sound on the subject, to a certain degree; but I take decided objection to his extremely large and short bearing. Arguments in favor of short front bearings on lathe spindles seem to me entirely at fault, on account of the diminished durability of the bearing and

the liability of the spindle to wear out of line.

If Mr. Smith had specified that his ideal lathe was never to be used except on gear speed, there would be more sound sense in his argument. In view of the fact that the average lathe (up to 20" swing at least) is generally used on all sizes and classes of work within its capacity, it is evident that something must be sacrificed from the maximum rigidity required for heavy work to obtain the easy working and quick acting parts necessary on the lighter classes of work. As smaller parts are more easily constructed and are cheaper, our machine tools often err toward lightness.

Again, there is the prominent fault of short bearing surfaces visible in most of our engine lathes as well as in other classes of machines. Lathe spindle bearings should be larger than they are, and in nearly every case a third longer. The spindle itself on most of our lathes should be longer, and the cone should have at least five changes, or should be proportioned so as to give even graduations of speed down to the slowest gear speed. Few lathes made at present will do this. Light, narrow belts won't do. "Uncle Peter," with his inch belt on an 18" or 20" lathe would hardly succeed in moving the spindle on the slowest belt speed of a rigidly constructed lathe, to say nothing of doing any work.

The belt speed of a lathe should be strong, and capable of driving a stiff feed on shafting, or any work of small diameter. What a waste of energy and wear of lathe, to use gear speed on small work! While we are enlarging and lengthening the live spindle we must not forget to enlarge the dead spindle by about a third of its dimensions, as found in most lathes made at present. Lathe centers should be enlarged proportionately.

In doing short work on centers, the dead spindle is, in nearly every case, obliged to be run far out from its bearing, and it can hardly be made too rigid. It would be a good idea to have a boss three or four inches long added to its bearing, on the end of tail stock, toward the work. The boss should be made ogee-shape, and would give room on short work, and at the same time be a support for the dead spindle. The set-over arrangement of the tail stock should have an adjustable stop arranged so that the lathe could be set instantly to turn straight, after being set over for taper. Much time is always lost in this seemingly simple operation.

With improved screw cutting devices now coming into general use, the day is not distant when the reversing belt will be done away with. I would suggest a much better use for it, viz.: Place upon the line shaft a second driving pulley in addition to the other, but considerably larger, and belt so that the lathe may be run forward (by simply using another shifter) with either. Thus with the same cones, we double the number of speed changes, and either of the two can be instantly manipulated by the operator.

I do not claim this device as original or new, but can recommend it as very useful.

Further discussion of this interesting subject I will leave for a future letter, but in closing will say that some of your correspondents seem to discuss this noble tool solely from the engine point of view, making it a Hercules of strength to "tool off" great quantities of metal, literally endorsing the old saying, that "A workman is known by his chips."

The writer's experience has been that in well ordered shops, a cut a quarter inch deep is exceptional, and more often the cut is not more than one-sixteenth of an inch deep. In building marine work and other massive machinery, there are, of course, exceptions to this, but let us hear less about slash cuts and more about fine fits, accurate workmanship, and the judgment required in executing such jobs. The American engine lathe is improving, but there is yet a field for progress in the line of rigidity, wearing surfaces, and devices saving time for the operator and money for the employer. Not every one, perhaps, has stopped to realize the saving, for a term of years represented by a few moments each day gained by using convenient devices. I may in future say something upon the subject of "V's *versus* Flat Ways."

OAKLEY S. WALKER.

Watertown, N. Y.

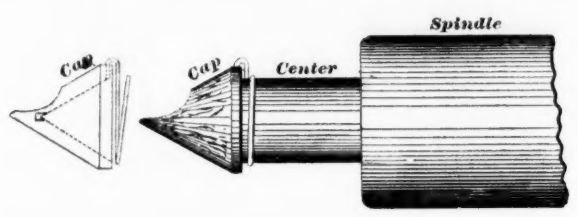
A Half Center.

Editor American Machinist:

I send you a sketch of a half center. The device I think is new, and every machinist that has use for a half center will see the value of it, as it is easily adjusted and works as well as any center. The friction being so much greater on the inside than on the outside, keeps it from turning with the work. It will fit any center turned at 60 degrees, as it fits only on the bevel part, and a coil of small wire keeps it from falling off while taking the work out of the lathe.

JAMES CARR.

Straight Line Engine Co., Syracuse, N. Y.



A HALF CENTER.

Lathes and Lathe Appurtenances.

Editor American Machinist:

The old and inconvenient tool post that has so long been used and is still so much supplied by builders of modern lathes, is, and rightly should be, abhorred by all machinists who take any pride in the business. Any tool post that will not raise and lower the tool bodily is not worth having. A tool is ground as to rake and clearance with due regard to the body, and any tool-holding device that simply elevates or depresses the point or cutting edge partly destroys these conditions and does not give the best result possible of tools. I venture to say that if makers of lathes had to use these bungling tool holders themselves, not another lathe made would have them. Good improvements in this direction have been shown in the AMERICAN MACHINIST.

Then there are annoyances that result from handles and hand-wheels. Handles that are intended to operate a feeding device not only on lathes, but on other machines as well, should be perfectly balanced, as mentioned in the AMERICAN MACHINIST of last week, so that there will be no heaviest part to drop to the lowest point by the force of gravity the moment the hand is taken off. These unbalanced handles are a source of daily trouble.

A very little jarring gives still greater assurance of their starting off, heavy end down, when they are not wanted to. By unbalanced hand-wheels I mean such as have a handle fastened in the rim. I believe the three balled handle, balanced, is the best in most cases. A plain hand-wheel, though, I consider best for tail-stocks of lathes.

Another defect exists in not supplying covers of convenient lengths for the "ways" to keep them clear of grit and dust. Covers are now generally supplied for cross screws and guides of the slide-rest, then why not for the ways? Although they do not catch much of the turnings yet they get grit and dust, which works injury. Covers of some light material attached to the ends of the carriage and in such a way as to allow of being quickly removed, would add much as a protection. And speaking of the ways, I notice that one of your correspondents, in issue of Dec. 23d, advocates the flat form. I believe that for light lathes the V's are best. Their smaller wearing surfaces are sufficient to withstand ordinary usage for a long time, and their resistance to the carriage, according to my experience, is less. For the heavier lathes the flat ways I think much the better.

Belt feed is another poor feature. It is not positive enough, nor is a train of straight line, or compound gearing, commendable. It is too much trouble to change feed with such gearing. The combination of six gears arranged in cone fashion for three speeds, and changed from one to the other by a round sliding pin, is much more convenient, and to be depended upon.

I want also to add my protest against some of the complications that are placed under the apron of the carriage to make up the feed rigging. A splendid new lathe was placed in our shop the other day, which had nearly enough in the feed rig for two lathes. It had five or six bevel wheels, one worm wheel, and three or four spurs. It also had underneath the screw a separate feed rod. Now, when all the necessary fixings to complete this feed apparatus is in place, it seems like a little machine shop hid under the apron. I think the well-known friction wheels, operated by the screw by means of a key-way through its length, is as simple and as good as anything yet used.

I will conclude by recommending a device used by a Minneapolis machinist, which applies to the tail-stock, and which is not patented. He fastened two small rollers upon a shaft, and placed it under the tail-stock, so that the rollers would roll upon the ways. A flat spring was placed just inside each wheel to form the journals. When the tail-stock was loosened, the springs would throw the weight on the rollers, and he had the satisfaction of rolling it along instead of sliding.

This device was illustrated and described in "Shop Kinks," No. 32, by Lewis F. Lyne, which appeared in the AMERICAN MACHINIST of July 1, 1882. If makers would adopt such a device, they would save much prying and tugging, besides lessening wear on the ways. I would suggest its adoption.

Cleveland, O. H. C. B.

Province of the Draughtsman.

Editor American Machinist:

Some years ago we were frequently thrown in contact with one of the worthy contributors to the MACHINIST, and never left his office without feeling benefited by having been there. On one occasion he was putting the finishing touches to a drawing for some machinery.

A pillow block was shown of a somewhat unique design, and we ventured to ask our tall friend how he expected such a shape would ever be moulded. The reply was, "I don't care how they mould it; that is the business of the pattern maker and the moulder, not mine." This was a turn taken by our versatile friend that we were least expecting, and not wishing to have our question disposed of in so summary a manner, we undertook to show reasons why he should know how this pattern was to be made and how it was to come out of the sand. A desultory discussion ensued, and we separated without having settled the question to the satisfaction of both.

But by his plausible sophistry we were half persuaded that we had been practicing wrongly, meddling with other men's business, and unnecessarily spending much time and thought on drawings.

Subsequent years, however, have confirmed us in the position then taken, and we have many times since then thought of this incident when seeing a moulder fishing out flanges or lugs from some inaccessible part of his flask; or perhaps trying to secure hanging sand that was almost sure to spoil the casting; or, again, when called upon to settle a disputed question between the moulder and pattern maker as to the proper way of moulding a certain piece.

Such experiences have caused us to believe that draughtsmen should have in mind methods for executing their designs, whether applied to the moulding room, blacksmith shop, pattern or machine shop, and to see, as far as possible, that their plans are properly carried out. In cases where the designer cannot be with his drawings, it is the more important that instructions thereon be as explicit as possible, even though such explanations seem superfluous to some; it may be needed by others.

This leads to a consideration of what a draughtsman should be, and the scope of knowledge to be possessed by the constructor of machinery.

It may be claimed by some that we are requiring a designer to know too much, and that our lifetime is too short to become master of a half dozen trades; and so it is, in a certain sense, yet it must be admitted that the more thoroughly practical the draughtsman becomes the better fitted he will be to design and execute his plans.

Natural qualifications may deserve here a share of our attention. In starting a young man off in an avocation, it would be well if his natural fitness and inclinations could be consulted; but this is rarely done.

The manufacturer has a son in whom he takes pride and wishes to raise to the highest order of mechanics, a mechanical engineer. During his vacation the boy is put to work in the machine shop, and before entering a technical course he is kept at this employment a year or two. As a rule, such a boy chafes a good deal under the shop discipline, and gives his foreman a good deal of trouble. He has learned to grind a drill or cold-chisel, and can do a fair job on a drill press, when he starts off to school. In due time he graduates, but by this time he has learned to part his hair in the middle, and knows entirely too much to go back into the machine shop; for in this case no one would know him from any other apprentice.

To encourage the boy and bring him out, his father places him at the head of the drawing room in his establishment. As for genius or originality, he never had any, and, as a result, the productions from such a source are simply copies of other men's designs with many of the essentials left out. Against such piracies the patent laws only partially protect. Such concerns sometimes fail, and then we are likely to have an addition to the list of patent solicitors.

The plan now employed by some of the schools of connecting workshops with them is a good one, and will afford excellent opportunities for judging of the natural fitness of students for the places they wish to fill. It would be well, if it were possible to do so without giving offence to the parents, or affecting the interest of the school, to send many of the applicants home to seek other avocations than those of mechanical engineers, or designers and constructors of machinery.

The times in which we live may be said to be fast, and with the superior advantages of the day, men are educated rapidly. But with the exception of a few cases, which may be considered prodigies, it will be best to look for the skillful constructor and engineer among bearded men. DYNAMICUS.

A singular and remarkable occurrence took place in the large foundry of the Reading Hardware Co., where ninety men are employed, on Wednesday. The atmosphere on the outside was dense, and all the windows were tightly closed. Suddenly a large amount of sulphur and gas was driven out of the opening in the cupola among the men, scattering all over the foundry. Ten became deathly sick and dropped to the floor at once. The others commenced vomiting and complained of severe pains in the stomach and head. Two were perfectly unconscious, and remained in that condition for some time, having to be taken to their homes in carriages. The foundry presented the appearance of a huge hospital, with men lying in every direction. About seventy men were affected, and the foundry was not in operation on Thursday.—*National Labor Tribune.*

Improved Lever Drill.

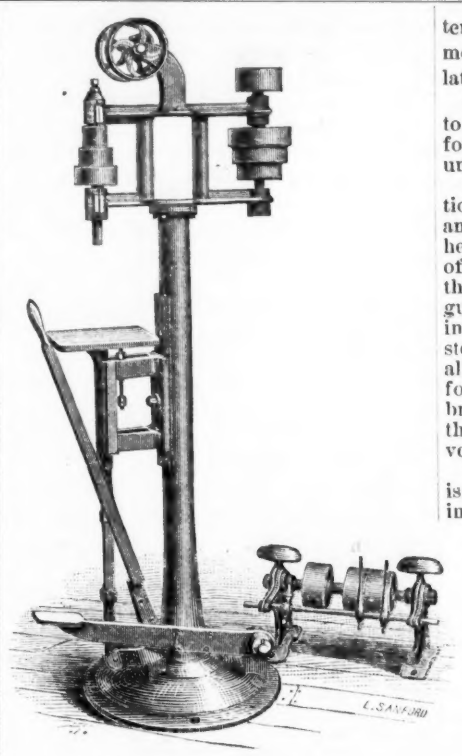
The drill press presented herewith is intended chiefly for light, rapid and precise drilling. This machine is comprised of an upright hollow column of cast iron, with a frame bolted to the top for carrying two vertical parallel spindles, as shown. One of these spindles carries the drill, while power to drive the same is transmitted from one spindle to the other by means of a belt. Three changes of speed are obtained by the cones. Gears are avoided by running the belt from the countershaft to the machine around idlers, as understood from the engraving. The boxes for the spindle are so constructed as that all lost motion may be readily adjusted.

The capacity of this machine is to drill holes from half-inch in diameter downward, and to the center of a circle twelve inches in diameter. The table has a vertical movement of eleven inches upon the column, and may be quickly secured in any desired position to suit the height of work.

The table is attached to a vertical slide, arranged so that the wear may readily be taken up, and is operated by a compound lever. This lever may be moved either with the foot or by hand.

It will be observed that the pressure applied to produce the feed in drilling is in direct line with the drill, which plan overcomes unnecessary friction.

The advantages secured by the use of long levers are worthy of consideration, as the movements to and fro are more nearly in straight lines. When so desired, either lever can be removed, and the remaining one used to operate the table. Under the table is a stud, with jam nuts for stops, in gauging the vertical movement of the table. By means of this adjustment any number of holes may be drilled to any required depth. The application of power to produce the feed is good, and is very sensitive, particularly on light work. These drill presses are made either with one or four spindles, and may be used both for wood and metal work. They are being introduced by H. Prentiss & Co., 42 Dey street, New York.



IMPROVED LEVER DRILL.

A Basement Floor.

A basement floor or sidewalk can be made very easily in the following way: Spread out the iron chips gathered from the machines in a shop in layers over the floor or walk, and sprinkle common salt liberally between each layer. The salt unites the chips into a hard mass (developing considerable heat as the process goes on). The sidewalk along David W. Pond's machine shop in Worcester, Mass., was made in this way. It is about six inches deep and very firm.

A Standard English Lathe.

The engraving herewith, which we reproduce from our esteemed contemporary, *Engineering*, represents a "six-inch standard sliding, surfacing and screw-cutting lathe," as designated by that journal. According to our American machine nomenclature, it would be called a twelve-inch swing lathe. It is one of a series of standard patterns of lathes from five-inch centers (or ten-inch swing) upward, made by Astbury & Dawson, Grantham. Some "eight-inch" lathes of this series have recently been supplied to the British Government for the Portsmouth Dockyard. As will be seen by reading the following description, which we also reproduce, the lathe has some features not usually applied by tool builders on this side of the Atlantic.

Cast gear teeth on an engine lathe, for instance, would not be favorably received by our machinists, but the standard gauge and template system applied in building—or, more accurately said, *manufacturing* the lathes—is worth some attention:

"These lathes are constructed throughout to a system of standard gauges and templates for each size, thus insuring accuracy and uniformity of quality.

"The six-inch lathe shown by our illustration is arranged with self-acting surfacing and reversing motions. As will be seen, the headstock is double geared—the proportion of gearing being three to one—with eccentric throwing-out motion, and is fitted with hard gun-metal conical bushes, scraped to a bearing for the mandrel, which latter is of cast steel, with an adjusting cone for taking up all wear. The cone pulley has four speeds for a 1½ inch belt. A conveniently-arranged bracket at the end of the headstock carries the pinions and lever for instantaneously reversing the motion of the guide screw.

"The gap bed, which is fitted with a bridge, is very strong, with ample breadth of bearing at top and bottom. It is ordinarily made 6 ft. long, admitting 3 ft. between the centers, whilst the gap takes in 22 inches diameter over the guide screw, and 7 inches from the face-plate. The bed is supported upon standards having a good breadth of base, and provided with brackets, which support a board for tools, etc., whilst underneath, supported between the standards, is an arrangement for catching the turnings, oil and water.

"The guide screw is accurately cut to a standard pitch, and is supplied with suitable supports on the under side, at intervals according to length of bed. The nut for engaging with the screw is extra long to resist wear, and actuated by an improved motion.

"The saddle takes a long bearing upon the bed and carries a compound slide rest, arranged to swivel for turning taper work, the bottom or cross slide being long to exclude the cuttings. The self-acting surfacing motion is taken from the guide screw, through a worm-wheel and spur-gear as shown; this motion is controlled from the front of the saddle by means of a friction cone within the pinion on the screw of the cross slide; the latter can be traversed by hand in the usual way. The worm wheel is made of gun metal and the teeth are machine cut. The saddle can also be traversed quickly by hand.

"The top driving gear, consisting of countershaft, a pair of fast and loose pulleys, and cone, is supported by hangers with swiveling bearings of ample length. The lathe is provided with a set of twenty-two change wheels and table showing their use, a 12-inch face-plate, driver plate, a back stay to bolt on the saddle, and a full set of wrought iron keys. All the gearing is moulded from machine cut iron patterns, the small pinions being cast in steel. The slides which have large surfaces are fitted to a bearing by scraping. The various screws are made to uniform sizes and all working nuts and screw keys are thoroughly case hardened."

Metallic Triangular Scale.

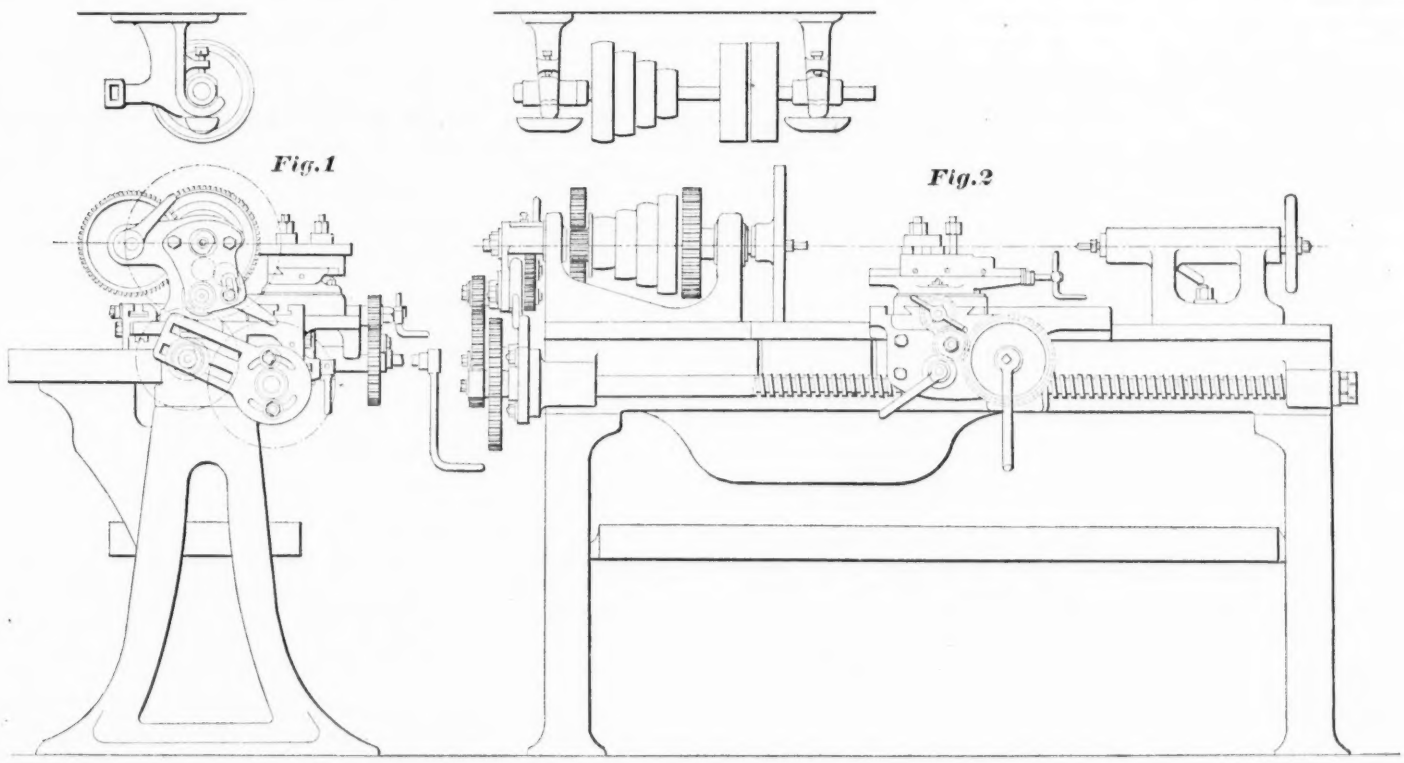
The triangular boxwood scale, for the use of draughtsmen, while so convenient as to be considered indispensable, presents several features that seriously detract from its utility as a standard tool. For instance, it lacks the quality of perfection as a measuring instrument attained in metal standards; it will warp and the edges will chip off, and the marks be obliterated by use.

The same scale, when of solid metal, while it does not possess the defects of the boxwood scale, is, if made of the same convenient size, so heavy as to be inconvenient to handle and substantially worthless for the purpose.

METALLIC TRIANGULAR SCALE.

These and other considerations have led to bringing out the scale illustrated herewith. This scale is made of brass tubing, and in size and shape is the counterpart of the box-wood scale, while its weight is only about 3¼ ounces (length, 12″). The ends are closed, and the whole nickel plated and left of a dull finish. Its lightness removes the objections to the solid metal scale, while the durability and accuracy of the latter are maintained.

These scales are made by Darling, Brown & Sharpe, Providence, R. I.



The pig iron manufacturers of the United States held a meeting in Pittsburgh, Pa., December 27th, for the purpose of taking steps to organize an association. An executive committee was appointed to frame resolutions, and report at the next meeting, to be held January 11th. At that time the association will receive a name and elect officers. The committee was instructed to take under consideration and report upon all questions relative to the tariff on pig iron.

A typical boiler explosion occurred Dec. 26th in Mason & Son's saw mill in a small town in Vermont. Two men were killed. The press despatch says:

"When the boiler went up, the head of it went through into the chair factory adjoining, and blew out windows and doors. One portion of the chair factory was blown out. The boiler-house was scattered over the farms adjoining Mason's. A 30-ton rock in the rear of the boiler-house was thrown three rods, and a little boy who was playing near by was carried four rods and had his face and body bruised. The cause of the explosion is a mystery. The boiler was repaired last Friday. It had not been used before that for two months."

Our reserve stock of the AMERICAN MACHINIST issue of January 7, 1882, having been exhausted, we will pay 25 cents each for clean copies of that issue. Persons returning such papers should note on the wrapper something that will identify the sender.

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NEW YORK, JAN. 13, 1883.

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Boiler and Elevator Safeguards.

Elevator accidents and boiler explosions are becoming so common that intelligence regarding them hardly excites the attention and leads to precautionary measures as readily as was the case a few years ago. Except among the relatives and immediate friends of the killed and maimed, each particular disaster is soon forgotten. The more frequently we read of fatal disasters, the less are we horrified by the recital. In time one comes to regard these destructive accidents almost with indifference. As a consequence only in a minority of establishments where boilers and elevators are used are suitable provisions made for preventing such catastrophes. The law in some localities, interposes to compel proper precautions, but even where the letter of the law is observed its spirit is often violated. "What is everybody's business is nobody's business," and not infrequently when the first virtuous spasm of reform has spent its force, evils to be righted are allowed, in a great measure, to drop from public notice.

It would seem that the only way to insure a correction or a partial correction of the evils resulting from want of care is to enlist a greater popular interest in precautionary measures. This is not an easy task. Much in that direction has been accomplished by the technical press, and through its efforts the daily press has been drawn into the work of arousing a public sentiment by pointing out the necessity for stronger safeguards.

The existing dangers attending the use of steam boilers have to an appreciable extent been lessened by the persistent work of boiler inspection and insurance companies both in this country and in England, but the work remaining to be done is much greater than that already accomplished. The new National Association of Stationary Engineers which has started off with bright promise, is expected to put forth its efforts, without relaxation to increase both safety and economy in the employment of steam machinery through its influence upon the public generally, and engineers particularly. Constituted as a national representative body of stationary engineers it would fail of its mission should it not accomplish much in this direction.

A more extended popular appreciation of the needless dangers connected with boilers and elevators, as generally used, will probably lead to more legislation to compel safeguards; but laws without a strong public sentiment to support them are worse than useless.

Trade Secrets.

Whatever the value of trade secrets may be elsewhere, in this country they appear to be substantially worthless. Especially in machine construction, a hint at their possession is looked at with a certain distrust, and those shops that have the best reputation are notably the ones that make no pretensions to mysterious operations. How it can be expected in shop practice, where workmen are continually going and coming, that some peculiar manipulations or arrangement will remain unknown for any considerable time, is not clear.

Secret processes are at a still further discount in this country, for the reason that those who buy machinery want to know, not only that it is good, but they want to know why it is good, and whether it can be kept so. A machine is likely, or certain, in time to need repairs, and no one wants machinery the parts of which can be satisfactorily reproduced only by special means about which there is some mystery.

Some years ago it was the practice of a few machinery firms to originate odd fractional screw threads, requiring special gearing to cut. The apparent intention was to secure a monopoly of repairs, but the means taken defeated the end, because users were soon educated to object to buying machinery on which a broken bolt, a lost nut, or a worn-out screw could not be replaced at any convenient machine shop. These odd threads operated about the same as mysterious processes in the manufacture of perishable parts of machines and machinery; that is, they detracted from the original value.

The secret of the cheap production of good machinery is an open one, but those who do not possess the skill and ability can no more appropriate it, however much they are allowed to examine processes, than they can write like the accomplished penman by stealing his pen and inkstand.

In every workshop in the country there may be certain special knowledge of value to the general industry, and it is to the fact that ordinarily there is no attempt to conceal it, and frequently something more than a willingness to impart it, that much of the material industrial progress is due. The compensation comes in mutual giving and receiving, and in the fact that what the giver contributes does not make him the poorer.

The skill and ability to plan and execute as occasion and circumstances require; those qualities of managers and workmen that cannot be given away or appropriated, constitute the secret of success, but are in no sense trade secrets.

A Lively Industry.

The manufacture of wire is a business that has grown with astonishing rapidity during the past five years. Such a thing as a fully equipped wire mill failing to do business enough to keep running full time and full force would, in these days, be almost a curiosity. New wire mills are frequently being built and put into operation, and almost every item of news from old mills is in the nature of an enlargement, running overtime, or putting on an extra force of workmen.

The question, "Where do all the pins go to?" may properly give place to this: Where does all the wire go to? The barbarous barb fence, which wounds and disfigures farm animals that rub against it, or venture too near it, takes a large amount of wire. Wire for fence without barbs forms another large item, and telegraph wire a still larger item in the product. In the mechanic arts, wire, both of iron, steel, brass, and copper, is used enormously, and new adaptations are constantly arising. Improvements in its manufacture tend to cheapen it as well as increase the supply, although for a branch of manufacture so extensive the improvements are slow.

What Then?

Various circumstances, particularly the possibilities of the Faure accumulator and the reported cheap production of aluminum have recently had the effect to revive an interest in the construction of flying machines. There is some reason for attaching a certain poetic importance to a means of locomotion so far outside the ordinary, and it may be very nice and all that to construct a machine for the purpose, but beyond the poetry of the matter is the question of real value, or whether a flying machine equal to reasonable expectations would have, outside perhaps of military operations, any real value.

The idea that people will ever trust themselves to any extent to such a means of travel is altogether improbable. Travelers take the risk of railway travel, but the failure of the motor is at least popularly supposed to result in nothing more than delay and inconvenience; or they take the risk of steamship travel for similar reasons, but that they will willingly put their lives against the probabilities of the continued working of a motor, as must be done with the flying machine, argues too much faith in things that can never be perfect.

Beyond the satisfaction of theorizing and dreaming over the beauties of such a means of locomotion, or the satisfaction of solving a difficult problem without the hope of reward beyond that satisfaction, it is not easy to see what there is in the idea to attract serious attention. It is altogether unlikely that a "steady business" will result from the perfection—using the term in its ordinary acceptation—of such a machine for some time, not, for instance, until after the law of gravitation is annulled, or until the effect of falling from considerable heights in obedience to that law is materially modified. Nevertheless, since there are really no grounds for assuming as impossible the construction of a machine that may, after some sort be propelled through the air, there is little doubt that some fortunate individual will, in time, construct one, and about the same doubt that after having succeeded in overcoming the physical difficulties in the problem of its construction, he will, so far as the business aspect is concerned, find himself trying to answer the query, what then?

Bad Wagon Roads.

We have before this called attention to the hindrances to general business caused by neglecting to improve the common roads, especially in the winter and early spring. The people of any section of country who allow their wagon roads to become so poor as to make it worth one-half or one quarter the value of a load of produce to get it to a market or a railroad station within a reasonably convenient distance of the farm must suffer heavy losses for their neglect; but it seems there are localities where their condition is even worse. As an example, we clip the following item from a late issue of the Fort Worth (Texas) *Age of Progress:*

"There is a general complaint from all quarters about the bad roads leading to Fort Worth. Thousands of dollars have been lost to the city of Fort Worth for no other reason than that the roads were in such a condition that it was almost impossible to reach the city with loaded wagons. Let the merchants and business men of the city go to the county court and ask them to look after the roads and see that they are kept in good condition. We have met several farmers this week who say it is worth a load of produce to get it here."

If a town wants manufacturers to locate in its neighborhood, its citizens should see that railroad facilities are not the only means of transportation that can be depended upon twelve months in the year. The railroad companies, who must be considerable losers in freight by the bad condition of country roads along their lines, might profitably take an active interest in the matter.

If "A. O.," who writes from Des Moines, Ia., will furnish us with his full address, we may be able to communicate with him to his advantage. We make an exception to our usual practice, in his case, because he is a stranger in the country, and unused to its customs, and because happening to show his letter to a manufacturer, to emphasize the carelessness of writers in withholding their names, we heard something of interest to him in the line of his inquiry.

The incandescent system of electric lighting seems to be giving good results in New York City where independent power is used, but in some cases, at least, where the lights are produced by power from a central station, considerable dissatisfaction has been expressed.

Recent discoveries in England of a new process for extracting aluminum from clay have attracted considerable notice on this side of the Atlantic, although particulars are wanting at this writing. It is said that the metal can be produced so as to make it comparatively cheap. It has hitherto been too expensive to be used for many of the purposes to which it is best adapted. The metal is very malleable and ductile, takes a high polish, and is not tarnished any more easily than nickel, or even gold. It is a very light and strong metal, and can be made hard or soft by manipulation. Aluminum would occupy a very important place in the mechanic arts if it were low priced.

We give a large share of the space in this issue to drawings of a chucking head for a lathe, in order to explain an admirable system of working drawings. As full drawings take so much space, it is seldom we can provide a place for them in our columns.

The California Architect and Building News of San Francisco is a live monthly mechanical journal. We prize it more than any other exchange that reaches us from the Pacific States. It is published in neat form, and seems to be well patronized. Its proprietors are the San Francisco Architectural Publishing Company, and the subscription price is $2.00 a year.

A few years ago there were a number of well known engineers with offices in New York City, whose services could be secured for a short or long time, for tests and other work belonging to the profession. Since then a change has taken place and most of the well known engineers are regularly connected with certain establishments. Facts go to show that an engineering office business as a rule, does not adequately pay even those most skilled in the profession. There are, of course, exceptions to any rule. Beginners often find great difficulty in establishing an office business.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(9) Subscriber, Newburg, Ohio, asks: What varnish can I use to protect drawings from dirt? *A.*—Bleached shellac cut with 95 per cent. alcohol is very good for the purpose.

(10) R. A., St. Paul, Minn., asks: 1. Are there any patents on the Brayton petroleum engine? *A.*—Yes. 2. Who manufactures stoves for burning water-gas? *A.*—We are not aware that stoves are manufactured especially for burning this gas.

(11) W. A. L., Syracuse, N. Y., asks: Can you give me the revolutions per minute and diameter of wheels of paddle-wheel steamboats on rivers, sound and ocean? *A.*—Revolutions from 13 to 45; diameter of wheels from 16 to 40 feet.

(12) A. C. W., Canoque, Ont., asks: How can I make a cement for sticking labels on iron? *A.*—Any good liquid glue will answer the purpose; or add two drops of glycerine to the contents of a small bottle of mucilage; or macerate glue in water, then add to the mixture 9 parts rock candy and 3 parts gum arabic.

(13) C.S., Champlain, N.Y., writes: I am using a boiler, and am obliged to use hard water. What can I use to prevent the formation of scale? *A.*—In using a compound it is quite important to know, by analysis, the composition of the water. Crude earth oil is sometimes used with good results, and sometimes soda serves a good purpose. There are also mechanical boiler cleaners in the market that give good satisfaction.

(14) H. H., Jersey City, N. J., asks: 1. Where, in New York, can I obtain a license as stationary engineer, and what will be the cost? *A.*—Apply at the central police station, Mulberry street. There is no charge. 2. Can I get the back numbers of the AMERICAN MACHINIST for 1882, and what will they cost? *A.*—All the back numbers for the year named, except the issue of Jan. 7, are readily obtainable. Their cost here is 6 cents a copy.

(15) C. E. F., Allegheny, Pa., asks: 1. What is the standard taper for gas pipe taps from 4″ down to ¼″? *A.*—The standard taper for gas pipe, all dimensions, is ¾″ to the foot. Some mechanics make taps of the same taper, while others believe it better to make the taps 1″ taper to the foot. 2. What is the outside diameter of the small ends of such taps? *A.*—There is no established practice in that respect.

(16) C. D. R., Mt. Holly, N. J., asks: 1. Can you give me a receipt for a cement for stopping holes in iron castings? *A.*—Mix to a thick paste as required for use, powdered sulphur 1 part; sal-ammoniac 2 parts; cast iron borings 80 parts. 2. How can I calculate the weight of a casting from the weight of the pattern? *A.*—It is customary, as a rough approximation, to allow that the casting will weigh 16 times as much as the pattern, when the latter is of pine. 3. How much does cast iron weigh per cubic inch? *A.*—26-100 of a pound.

(17) F. M. C., South Groveland, Mass., writes: I have a double-acting plunger pump which has become so worn that the packing works out between the gland and the plunger. It will not stay packed more than two days, and often obliges us to shut down for a half day; how can I remedy it? *A.*—The only satisfactory remedy is to stop long enough to have the plunger turned true and the gland bored out and bushed. You can, perhaps, by winding a ring or two of lead on the rod next the gland make it do a little better than you say, but the best way is to bush the gland.

(18) W. H., Marshalltown, Ind., asks: Will you give me the correct measurements for squaring two lines, that is the distances from the point of intersection? *A.*—As we understand your question, you want to know the most convenient distances to use in the problem of finding the hypothenuse of a right-angled triangle. Measure off 3 feet on one line and four feet on the other. The square of 3 is 9 and of 4 is 16, which added together makes 25. The square root of 25 is 5, so if you mark off 3 feet on one line (from the point of intersection) and 4 feet on the other, if the lines are square these points will be, in a direct line, 5 feet apart.

(19) W. H., San Jose, Cal., writes: We use an air compressor for supplying air to small engines and pumps in the mines. When the air leaves the compressor it is hot, but after travelling through 1,000 feet of tunnel, the temperature of which is 90°, it will feeze in the exhaust pipe, sometimes choking it up and stopping the engine. Can you suggest a remedy? *A.*—The only remedy we can suggest is to protect the pipe through which the air passes to the engines from loss of heat by radiation, or supply a sufficient amount of artificial heat to the exhaust pipes to keep them from freezing. The freezing is only what could be expected.

(20) S. W., Chicago, Ill., asks: I. What solution is best for tempering such tools as milling cutters, taps, reamers, moulding cutters, and other tools which oil will not make hard enough? *A.*—Most or all of the tools named will harden sufficiently in oil, which is probably as good as anything for the purpose. If, however, you want to make harder, and are not satisfied with water you can try oil of vitriol. This is used by some for hardening milling cutters, while others use oil. It is better to heat the articles to be hardened in a box as if for case hardening, taking them out and dipping one at a time, exposing to the air as little as possible. If the tools you refer to are thin and light, and for cutting wood we should say use whale oil. 2. Is a tool tempered without drawing as good as when the temper is drawn? *A.*—Opinions differ in this respect. It is the practice of some to harden outright, while others claim that the quality of toughness is increased by starting the temper a trifle, hardly enough to be discerned, and doing it very slowly.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

C. M. Morse, Mech. Engineer, 132 Nassau St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. NewYork.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Lyman's Universal Screw Cutting Index and Rule for Compound Gearing—10cts. E. Lyman, C. E., New Haven, Conn.

Five 18″ (6 x 8 foot bed) first-class Engine Lathes ready for delivery. J. A. Fuller & Co., Worcester, Mass.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd.O.Chase, Newark, N.J.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

New Year's Present—"The Complete Practical Machinist," by Joshua Rose, 440 pp. 196 illustrations. $2.50 postpaid. Address, P. O. Box, 3,306 N. Y. City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O. value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on application. E. E. Roberts, manufacturer of Engines, Boilers, Saw and Corn Mills, 107 Liberty St., New York City.

MANUFACTURES.

A new file factory is being erected on Germantown avenue, above Ontario street, Philadelphia.

The Union Iron Works of Minneapolis, Minn., recently increased their capacity by building a foundry 60x120 feet.

The new Morris Hardware Company, at Youngstown, O., with a capital of $100,000, will soon commence operations.

Minneapolis, Minn., is reported to have erected buildings costing $1,794,000, for manufacturing purposes, in the last year.

Charles D. Wind & Co., have started to manufacture and deal in railway and machinists' supplies at 619 North Main street, St. Louis, Mo.

The Southern Scale Company, Chattanooga, Tenn., have their machinery in position, and have commenced work.

The Madison Plow Co., of Madison, Wis., is erecting extensive buildings for the manufacture of an extensive line of agricultural implements.

It is said that within a radius of 8 miles from the center of Birmingham, Ala., 6,200 men are employed in foundries, furnaces and machine shops.

The Rock City Stove Works, Nashville, Tenn., now employ 45 hands, melt 6 tons of iron, and turn out 35 finished cook stoves per day, and still have large orders ahead.

The Phœnix Iron Works, Meadville, Pa., have work ahead for several months. They are building boilers for the Panana Canal Co., and have just shipped a large engine and boiler to Brazil.

G. R. Lombard & Co., of Augusta, Ga., have recently enlarged their foundry and machine shop and added a boiler shop to their plant. They are building complete saw-mill outfits.

The Monongahela City, Pa., Foundry and Machine Shops have been sold to a Pittsburgh company, who will enlarge the capacity and employ hands at once.

The Spencer Rifle Company of Hartford, Ct., will build a new factory at Windsor in the Spring on the site of an old cigar shop burned some time ago.

The Sheffield Velocipede and Car Company of Three Rivers, Mich., is building a two-story brick addition, 40x60 feet, to increase the capacity of the works.

The Matthews Cotton Factory, Selma, Ala., will make considerable enlargements. They will put in a new 100 H. P. engine, and will employ about 250 operators.

The W. A. Wood Mower and Reaper Works, Youngstown, O., are to add other agricultural machines and implements to their products, which will make quite an enlargement of operations.

The town of Sunapee, Mass., has voted to exempt from taxes any new buildings and business, or business put into buildings now unoccupied, to the amount of $5,000 or more, for ten years.

The Peoria, Ill., Plow Works have bought a site for a mammoth factory in the upper end of the city, which is coming to the front as a place for manufacturing industries.—*Industrial World.*

R. J. Woods will soon set about the establishment of a cotton gin manufactory in Eufaula, Ala., and will have a foundry, machine shops and wooden works in connection therewith.

The Central Union Brass Works, St. Louis, are still adding new machinery and making improvements. Within the last five months this concern has increased its working force about 400 per cent.

The Nimick & Brittan Manufacturing Company, Pittsburgh, Pa., are erecting a large addition to their lock and novelty works, which will enable them to employ 100 more men.

Filer, Stowell & Co., Milwaukee, are furnishing a 26x36 engine for Davies, Blacker & Co., Manistee, Mich. The engine when complete will weigh 21 tons, and will be the largest engine on the Michigan shore.

A new tack factory will be started at East Taunton, Mass., the firm name of the proprietors being Barrett & Bosworth. The factory will be erected near the mill of N. S. Williams, and will be 20x40 feet.

Lattimore, Piggott & Co., is the name of a new company who have opened a machinery house at 715 North Second street, St. Louis, Mo. The company will handle a full line of wood and iron working machinery.—*Age of Steel.*

Twenty-five Milford, Mass., business men have formed a board of trade to invite and foster new manufacturing enterprises and obtain better terms for themselves with corporations and companies entering the town.

We have received a copy of a new 1883 catalogue of American turbine water wheels, shafting, gearing and mill machinery, issued by Stout, Mills & Temple, Dayton, O. It is a 116 page pamphlet, is well printed and contains some special engineering information.

A reporter of the Birmingham (Ala.) *Age*, while at Rising Fawn, on the Alabama Great Southern road, above Birmingham, was informed by Mr. L. S. Colyar, superintendent of the Brown furnace, that his company intended building several more furnaces at Rising Fawn, and that the coke to be used would be procured at Birmingham.

A screw factory is to be established at Afton, Chenango county, N. Y. Most of the necessary stock, $100,000, has been taken.

Warner, Mass., has voted to exempt manufacturers from taxation for five years. The town refused to exempt from taxation the shoe factory buildings, in which the business of manufacturing gloves will be carried on.

The Phœnix Iron Company, Phœnixville, Pa., have now put three more furnaces in their puddle mill. This makes 14 that they have now in operation. In August last they started with only three furnaces, and have been gradually adding others until they have reached the present number.

The Aurora, (Ill.) Malleable Iron and Machine Co., has been incorporated with $25,000 capital, all paid in. The business is a consolidation of the Aurora Machine Co. and Love Bros. Co. The officers of the company are George Love, President; A. L. Baker, Treasurer; Wm. Eggerman, Secretary and Manager.

The Meriden, Conn., Britannia Company pays taxes on $636,000, the Meriden Malleable Iron Company $75,000, Silver Plate Company $87,500, the Charles Parker Company $214,310, United States Screw Company $50,000, Wilcox Silver Plate Company $202,300, Wilcox & White Organ Company $83,000, Bradley & Hubbard Manufacturing Company $235,000, Foster Merriam Company $81,000. All these establishments pay out large amounts for wages.

The Deane Steam Pump Co., of Holyoke, Mass., are busily engaged upon two pairs of power pumps to be used for supplying city water works with a daily capacity of 3,000,000 gallons per day; also one compound condensing pumping engine, having a capacity of 2,500,000 gallons, and two duplex pumping engines having a capacity of 1,500,000 gallons, making in all three water works plants. Besides these the works are busy on their regular sizes of pumps for all kinds of hydraulic work.

The Gillespie Tool Company, of Pittsburgh, Pa., capital stock $100,000, was incorporated on the 11th of December. Of the stock Gillespie Bros. are allotted $50,000; J. E. Schwartz, of the Pennsylvania Lead Company, $15,000; J. H. Willock, of the Second National Bank, $15,000; H. G. Brown, of the Wayne Iron and Steel Company, $15,000; and A. B. Wigley, $5,000. The business is the manufacture of tools for oil wells and other purposes.

Seymour & Whitlock, consulting engineers and manufacturers of machinery, Newark, N. J., enclose us a pamphlet of an apparently well designed small power engine, and write: "Your article in the AMERICAN MACHINIST of December 2d, relating to Small Steam Engine Construction, is a matter to which we have given our special attention for some time past. * * * * Having read your article and seeing that it compares so favorably in every respect with our views as to what a small engine should be, we take the liberty to submit to you our efforts in that direction."

The question of giving bonuses to manufacturers has been agitating the people of St. Thomas, Canada. A new firm have applied for a bonus of $10,000 to start a wagon factory, and two old firms have applied for $10,000 each, to enable them to extend their present works and to add new industries. A committee was appointed by the council to formulate a scheme submitting a by-law to grant to manufacturers $50,000, to be managed by trustees, who will, on application being made, impose such terms and make such arrangements as will insure the employment of a certain number of workmen.

The Oregon Iron and Steel Company has been organized to establish iron works on a grand scale at Oswego, Oregon, with a capital stock of $3,000,000, its object in general being the establishment of a rolling mill. The general office will be in Portland, (Oregon). It is understood that the majority of stock is held by New York capitalists. The new company has bought all the property of the Oswego Iron Works, embracing furnace, ore mine, canal, waterpower and 24,057 acres of land. Mr. S. G. Reed, president of the company, is now in the East to contract for the machinery for the rolling mill and blast furnace. It is the intention of the company to begin the erection of works early in the spring.—*Boston Bulletin.*

Probably the longest steel plates ever made have just been rolled by the Otis Iron and Steel Company, of this city, says the Cleveland *Trade Review.* The plates, of which there are two, were 50 feet 6 inches in length when sheared, 51 inches wide in the center and ⅝ inch thick, and the ingots from which they were rolled weighed 4,400 pounds each. They were made for Morgan, Williams & Co., of Alliance, O., and will be used in the construction of a large traveling crane, which the above firm are building for the Dickson Manufacturing Co., of Scranton, Pa.

John Walker, of the Walker Mfg. Co., Cleveland, Ohio, late of Indianapolis, Ind., was recently the recipient of a very handsome testimonial from his Indianapolis friends, consisting of a Thompson Indicator, polar planimeter and pantograph, furnished by the American Steam Gauge Co., Boston, Mass. The new shops of the Walker Mfg. Co. are rapidly nearing completion, and will soon be prepared to furnish the public with its specialty of shafting, pulleys, gearing, &c., which it will manufacture under the patents and improvements of Mr. Walker, whose experience in this line extends over a period of twenty years. The new concern promises to be one of the enterprises of the future.

The Pennsylvania Bolt and Nut Works, at Lebanon, Pa., recently increased their capital to $50,000.

The Williams Wire Company have secured five acres of ground at the north end of the Calumet Iron and Steel Co.'s works, at Cummings, Ill., at which point they will soon commence manufacturing wire.

The Rhode Island Locomotive Works, of Providence, R. I., is at present a busy place, 1,000 men being employed, and the works running overtime. They have orders on hand from the C., M. & St. P.; C., St. P , M. & O.; Mexican Central; St. P., M. & M.; Canadian Pacific; B. & P.; N. Y., P. & B.; Southeastern of Canada, and others. Their capacity is 20 locomotives per month.

A Lewiston, Me., pump concern has purchased 2,000 acres of timber land and will cut both spruce and hard lumber. They have put in steam boilers and a 120-horse engine. All this is in the woods. They have laid miles of track with a wooden rail in the forest and run cars on it. They will ship their lumber from Philips, which is about ten miles from their mill.

The Dean Woolen Company's Works, at Newark, Del., when complete will consist of three sets of buildings, all built of stone in the most substantial manner. The new Corliss engine is of 125-horse power. The company is also erecting a substantial row of ten brick houses for its workmen. The estimated cost of the improvements is $75,000. The new stock company was organized in June of last year, with a capital of $200,000.

The Griffin Car Wheel Company, of Detroit, says the *Railway Review*, state that while they make 150 coneless or straight-tread car wheels, their total daily output consists of 300 car wheels, of all kinds and sizes, and besides 25 tons of car castings. Their orders, they say, come from roads in all parts of the country, and some idea of the extent of their business may be gleaned from the fact that their car wheels are at present in use on not less than 40,000 miles of railroad. The mileage or life of a coneless or straight-tread wheel is always guaranteed.

Robert Wetherell & Co., Chester, Pa., have recently completed two 300-horse power Wetherell's Improved Corliss engines, for the Brush Electric Light Company, of Philadelphia. These engines are to replace those which have been in use since the Brush Company furnished the light for Chestnut street, Philadelphia, and are guaranteed by the makers to run with one-half the amount of fuel required by the old ones. They are busy on an order for a compound Corliss pump engine for Gloucester, N. J., water works, which will have a daily capacity of raising 2,500,000 gallons.

Machinists' and Engineers' Supplies.

NEW YORK, Dec. 28, 1882.

During the past week inquiry in the supply market has fallen off somewhat and orders are small, which is owing principally to the temporary interference of the holidays.

There is a general tendency to look forward to the opening of the new year with the expectation of a good healthy condition of trade.

Prices continue to favor the buyer, but there is little or no indication of a disposition on the part of consumers to stock up until after the developments of the new year take a more definite shape.

Wrought Iron pipe is quoted at 65 per cent. discount from list.

Iron and Metal Review.

Circumstances in the Pig Iron market remain about the same as last reported. Consumers are indisposed to enter into large contracts until after the opening of the new year. Deliveries from the furnaces are fair for this season of the year, but consist chiefly of small quantities. Supplies are therefore slowly accumulating, but there seems no disposition to press sales.

Reduced prices of importation have the effect of keeping prices decidedly in favor of consumers.

We quote Foundry No. 1, $25 to $26. Foundry, No. 2, X, $23 to $24. Grey Forge, $19 to $20. The demand for Foreign Iron is slow and the stock in store is gradually accumulating and prices are somewhat easier in consequence.

We quote Coltness at $26; Glengarnock, $22 to $23; Gartsherrie, $25 to $25.50; Summerlee, $25.50 to $26; Carnbroe, $22; Eglinton, $21 to $21.50; Langloan, $25.50 to $26.

Nothing new in Iron, Steel, or old rails. Copper continues quiet with prices easier. Lake Superior can be had at 17⅞c. to 18c; Banca Tin 28c; Straits and Malacca 21¼c. to 21⅜c.; Billiton 21⅛c.; Lead 4.75 to 4.87½c.; Refined 8c.; Spelter, Common, Domestic, 4.90c. to 5⅛c.; Refined 8c. to 8¾c.; Antimony, Hallett's, 10⅝c.; Cookson's, 11¼c. to 11½c.; Nevada, 11½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

A mechanical draughtsman of good technical education and experience desires a situation. Address, Draughtsman, P. O. D. 38, New Haven, Ct.

Wanted Machinists.—A few strictly first-class vise hands or fitters, accustomed to fitting up machines. Liberal wages to the right men. Apply immediately to Niles Tool Works, Hamilton Ohio.

A theoretically and practically educated machine draughtsman and constructor (Swiss) desires an engagement. Address, A. S , 119 Washington street, Hoboken, N. J.

Wanted—position with a reliable Co., as Supt. or Foreman by a party well posted on brass patterns, small tools and automatic machinery. Address, X. D., this office.

Wanted—A good piece work clerk and timekeeper in a large machine tool works in Philadelphia. None but those with experience need apply. Address, with references, "Piece Work," office AMERICAN MACHINIST.

A first-class mechanical draughtsman of 9 years' experience on locomotive work and general machinery, wishes a new position. Railroad preferred. Address, Link Motion, care AMERICAN MACHINIST, 96 Fulton St., New York.

Steam Users in want of First-Class Licensed Engineers can be supplied with reliable men. Address, Benj. F. Kelly, No. 20 Cortlandt St., New York. Agent for James Jenks' Duplex Injector and The Baragwanath Steam Jacket Feed Water Heater and Purifier.

Wanted—A man who has had experience as foreman over lathe hands in a machine tool shop. He must have had some experience and know all the best methods of producing good work at the lowest cost. References from good sources are required. Amount of salary due largely to the ability of the man. Address, Machine Tools, AMERICAN MACHINIST, New York.

Wanted—To buy or lease a machine shop with tools in good condition, or arrange with parties to manufacture an established specialty. Give full particulars. Address, Specialty, care AMERICAN MACHINIST.

Second Hand Machinery Wanted—Three Engine Lathes, about 24″ x 25′, 18″ x 10′, 16″x 8′. Drill-Press, 24″ x 30″. Planer, 30″ x 30″ x 10′. Medium Power Punch. 2 Vises, 5″x 6″. Pressure (not fan) Blower, 8″ discharge. Surface Planer, 24″. Buzz Planer, 12″. Beach Scroll Saw, No. 1. Blacksmith Anvil. 150 to 200 lbs. Spot cash for any of above or approximate sizes; must be in first-class order. Principals may address, "Machinery," Gouverneur, N. Y.

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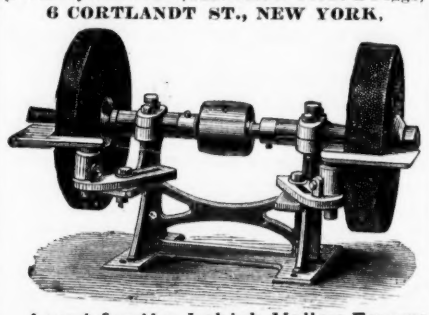

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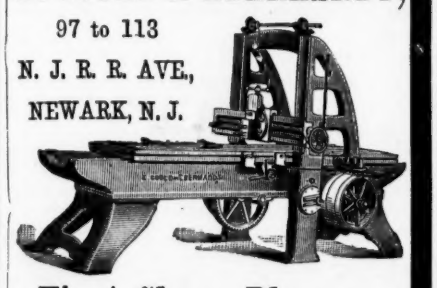

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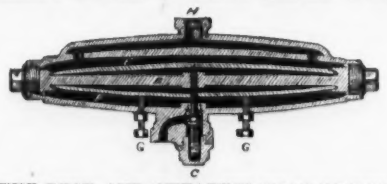

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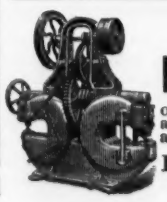

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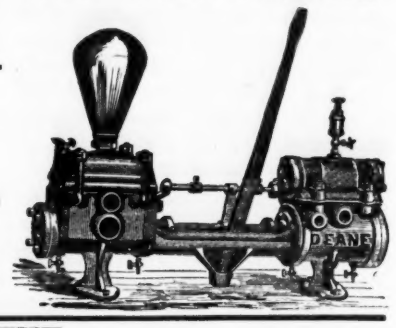

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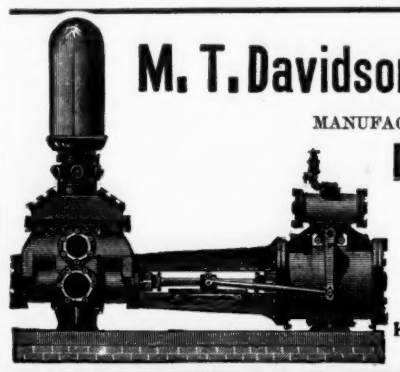

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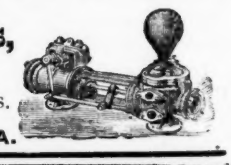

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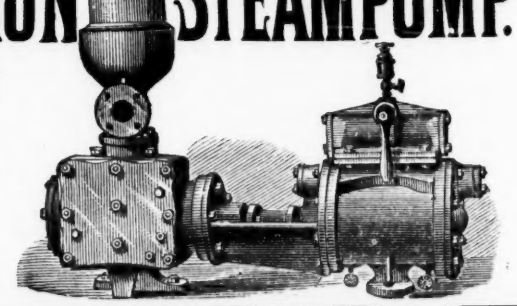

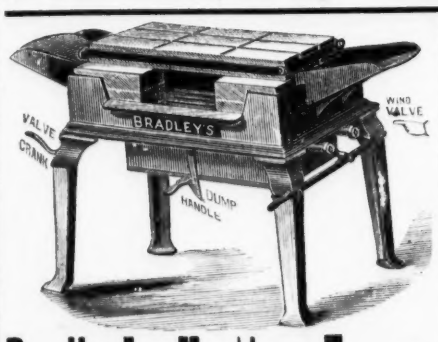

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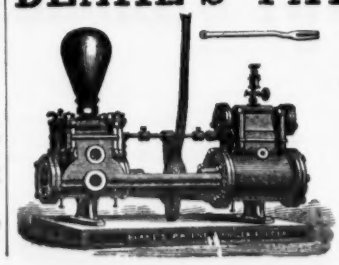

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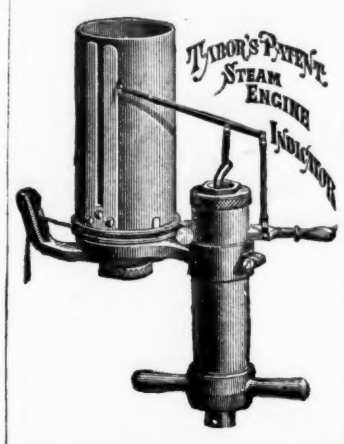

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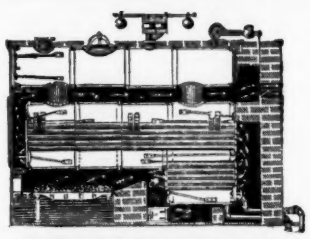

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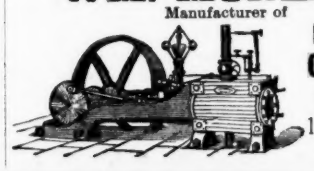

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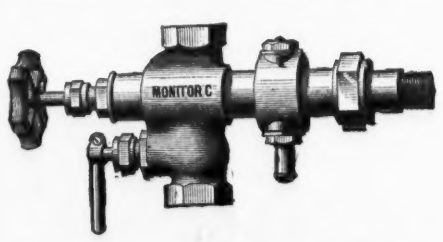

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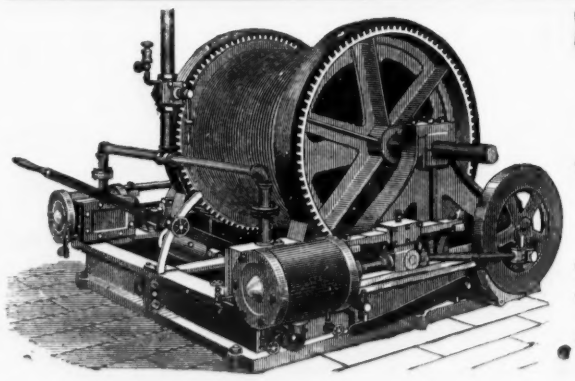

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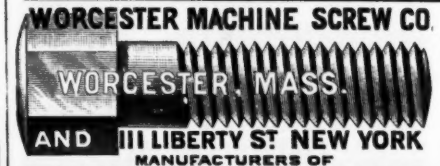

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" 11	1 3-4 "	1.25	
" 12	2 "	1.40	
" 13	2 1-4 "	1.60	
" 14	2 1-2 "	1.60	
" 15	3 "	1.80	
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Full set, 19 Dogs,		26.35	
No. 20	5 1-2 in.	4.25	
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When ordering, state as above, whether a full set or a set of 12 or smallest of 8. Users of these dogs prefer them to any other make.

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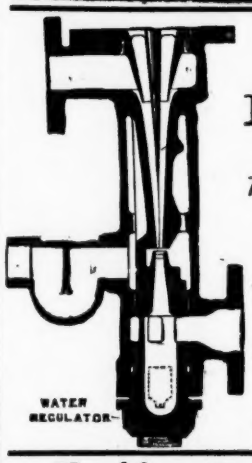

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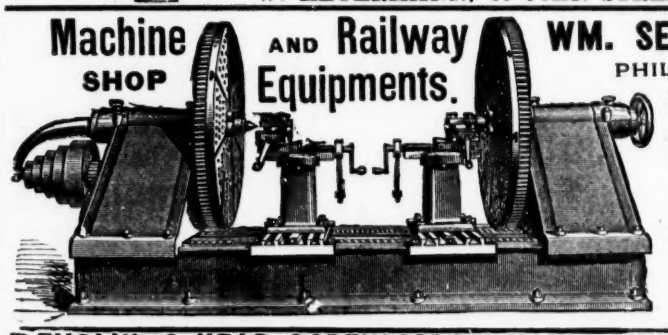

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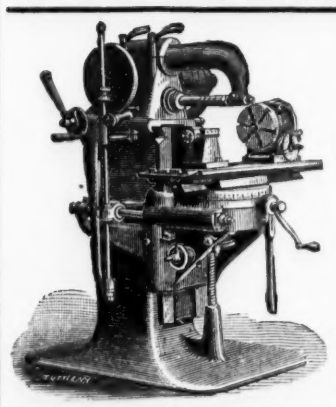

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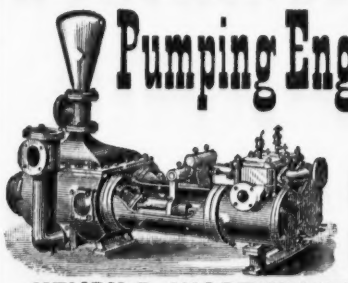

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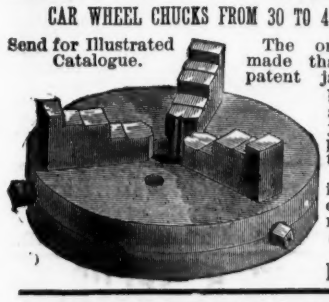

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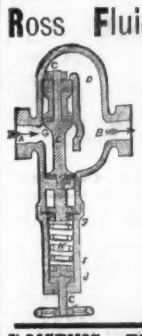

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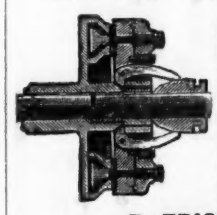

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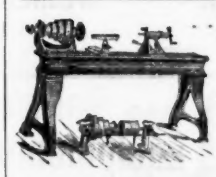

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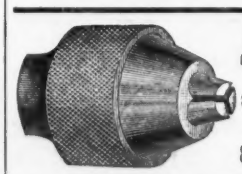

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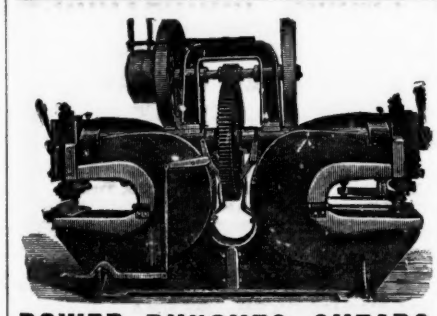

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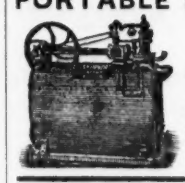

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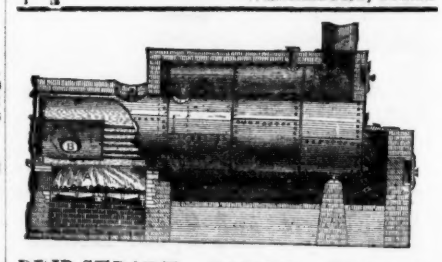

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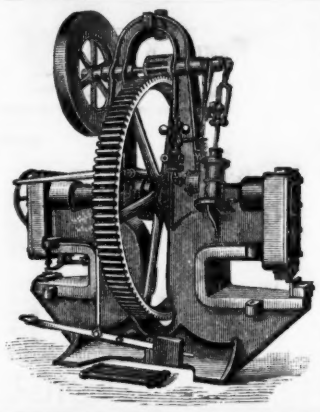

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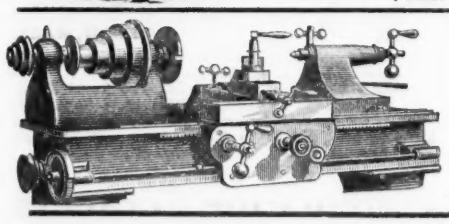

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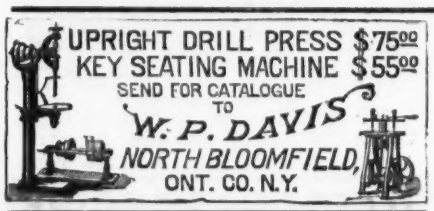

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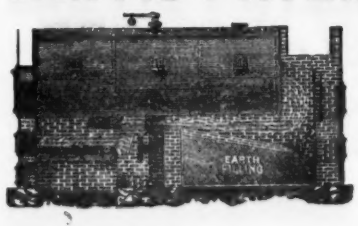

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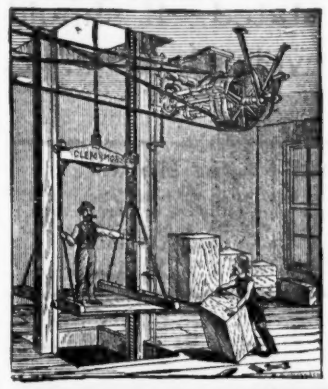

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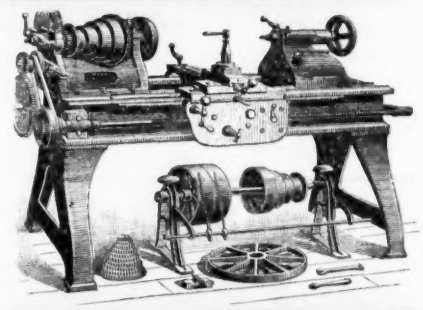

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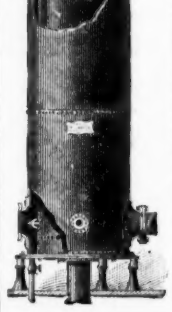

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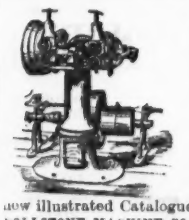

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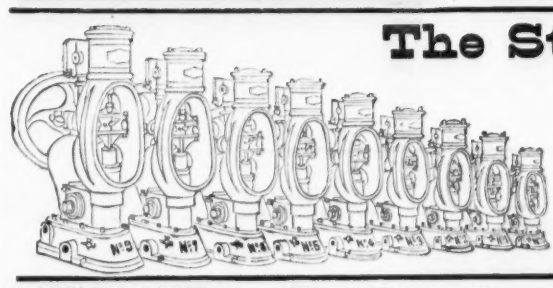

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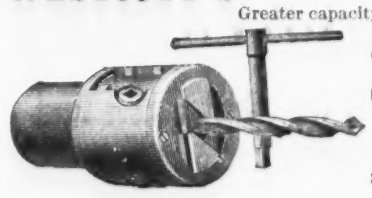

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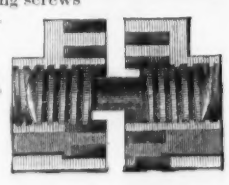

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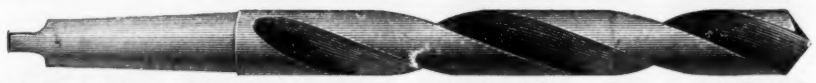

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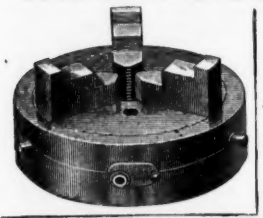

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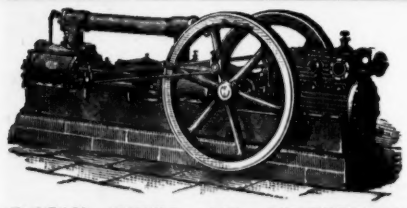

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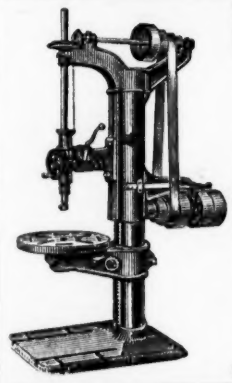

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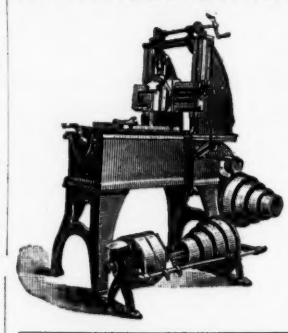

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It is self-oiling in its ways.
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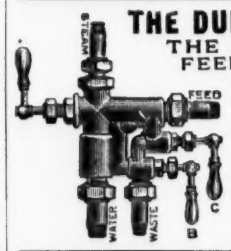

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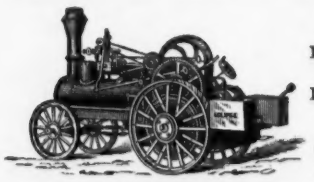

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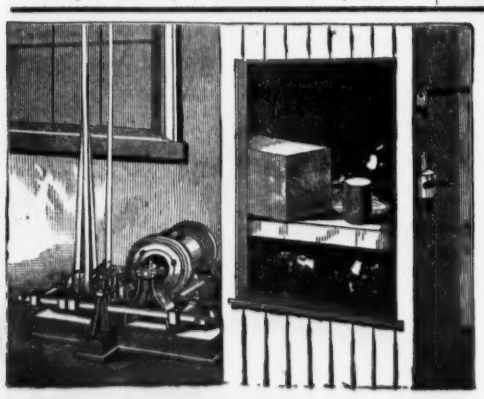

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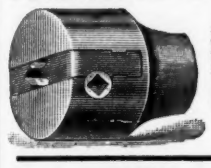

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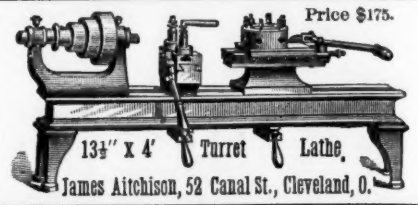

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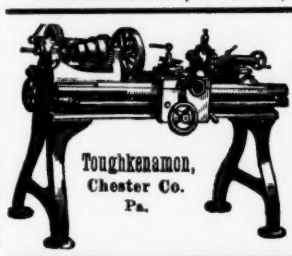

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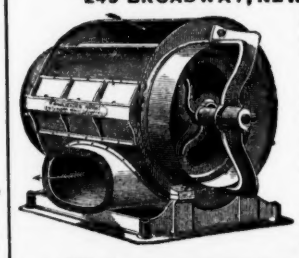

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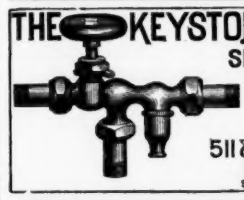

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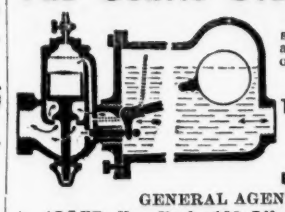

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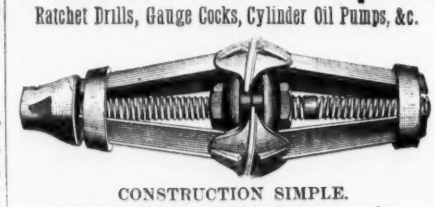

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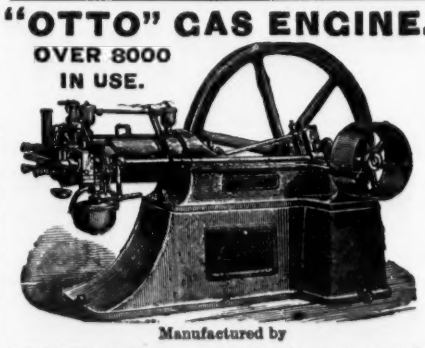

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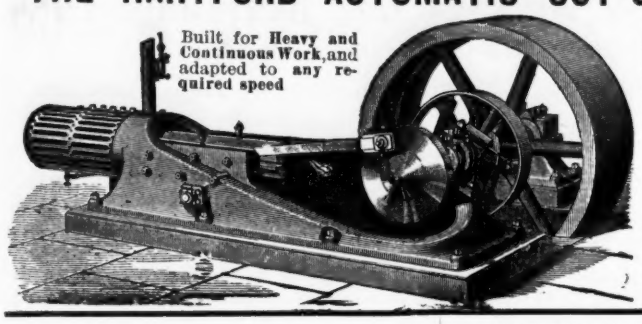

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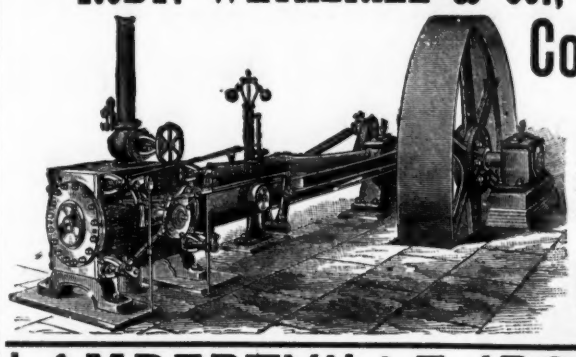

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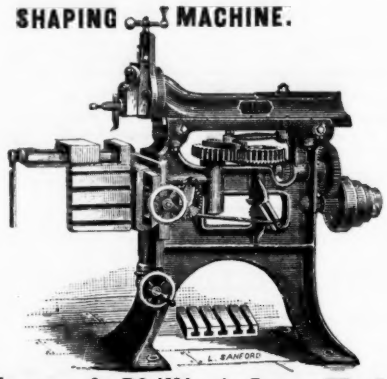

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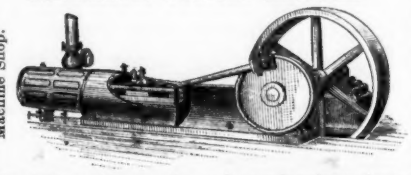

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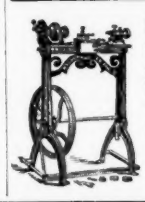

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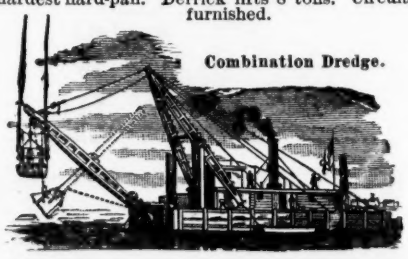
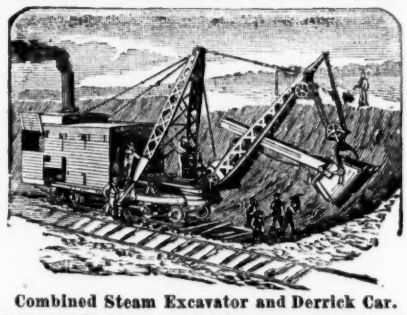


Combination Dredge.



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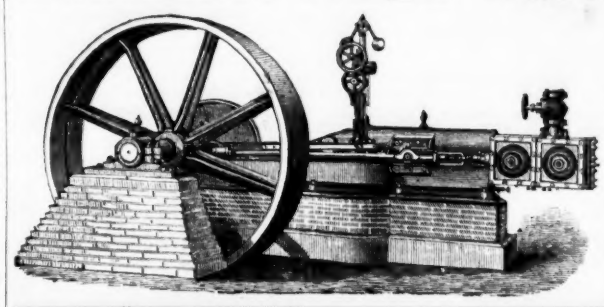

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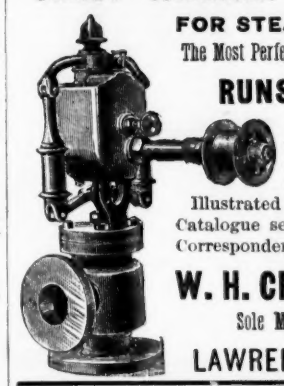

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1 36 in. " 18 ft. " " " " " 15.
1 36 in. " 16 ft. " " " " " 15.
1 New Corliss Engine, 16 in. x 42 in. Complete in four weeks.

The following on hand:

1 New Corliss Engine. 12" x 36". Complete.
1 60 in. swing, 24 ft. bed, New Engine Lathe.
1 42 in. " 16 ft. " " " "
1 26 in. " 12 ft. " " " "
1 26 in. " 10 ft. " " " "
1 30 in. " 18 ft. " " " "
1 30 in. " 16 ft. " " " "
1 30 in. " 14 ft. " " " "
2 22 in. " 12 ft. " " " "
2 19 in " 10 ft. " " " "
4 18 in. " 8 ft. " " " "
5 15 in. " 6 ft. " " " "
1 10 in. " 5 ft. " " " "
1 30 in. " 12½ ft. " " " "
1 26 in. swing, 14 ft. bed. " " " "
1 12 in. swing, 6 ft. Hand Lathe. New.
1 10 in. " 4½ ft. Bed Hand Lathe. New.
1 40 in. x 10 ft. Iron Planer. New.
1 38 in. x 12 ft. " " "
1 32 in. x 8 ft. " " "
1 26 in. x 6 ft. " " "
2 30 in. x 8 ft. " Planers. "
2 22 in. x 4 ft. " " "
2 38 in. Swing Upright Drills. B. G. & S. F. New.
1 23 in. Drill. B. G. & S. F. New.
1 22 in. " Upright Drill. B. G. S. F. New.
1 23 in. " Plain.
3 20 in. " "
1 18 in. Bench Drill.
1 4 spindle Drill. New.
1 3 " " "
2 4 " " Second-hand.
1 12 in. stroke Slotting Machine. New.
2 12 in. Shapers. New.
2 15 in. " "
2 12 in. stroke Shapers, traveling head, 40 in. traverse double tables. New.
1 6 in. stroke Hand and Power Shaper, with Counter-shaft.
3 Wood's Patent Bolt Cutting Machines to cut from ½ in to 2 in inclusive. New.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 No. 1 Screw Machine. Brown & Sharpe. 2d-hand
1 Screw Head Slotter. Second-hand.
2 Second-hand Profiling Machines
2 4½ in Hyde's Patent Centering Machines. New.
1 Emery Grinder. 2d-hand. for 10 in. Wheels.
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New Horizontal.
2 Double-Acting Presses, No. 3, nearly new.
1 No. 00 Fowler Press.
4 Single-Acting Presses, for power, "
20 Foot Presses, nearly new.
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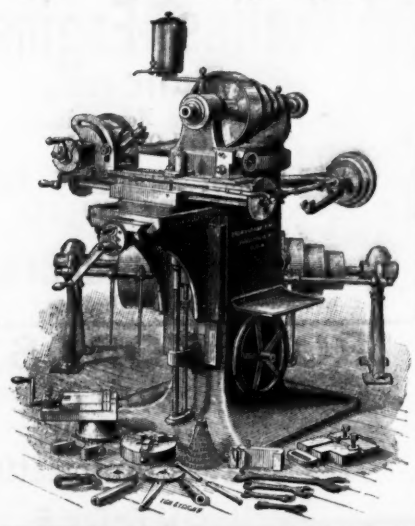

This machine has all the movements of a plain Milling Machine, and, in addition, is fed automatically, at an angle to the axis of Spindle, and has an adjustment to stop at any required point. The knee can be moved perpendicularly through a distance of 14 inches, and has a dial giving a reading in thousandths of inches. The Saddle, holding the Spiral Bed also, has a movement, parallel with axis of Main Spindle, of 6 inches, also indicated in thousandths of inches. On the Spiral Bed are placed a Head and Foot Stock, having centers upon which Reamers, Taps, Drills, or Mills can be held for grooving, etc., either straight or spiral, right or left hand. The Head, holding one center can be set at any angle between 5 degrees below a horizontal to a perpendicular position, and upon an Arbor inserted in the Spindle can be cut angular Mills, Cutters, or Bevel-gears. The Head can also be placed at a right angle on the Bed, and operations performed upon the face of work held in a chuck which goes upon the end of Spindle. The Vise shown in cut has Jaws 5 inches wide, 1 inch deep, will open 2¾ inches, and can be clamped upon the Bed at any angle.

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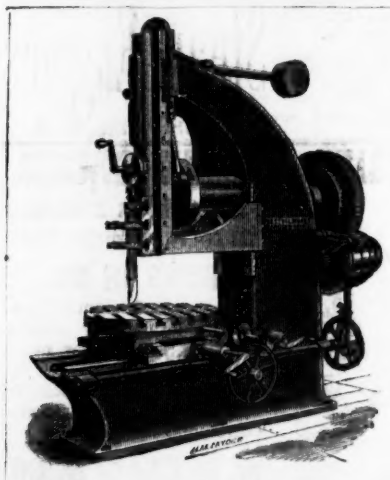

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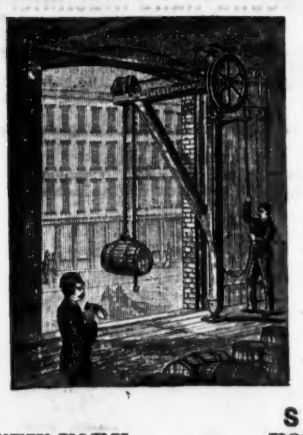

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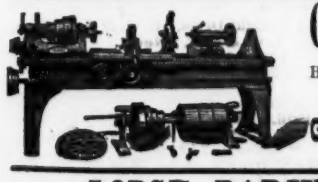

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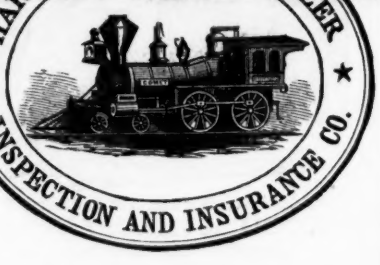

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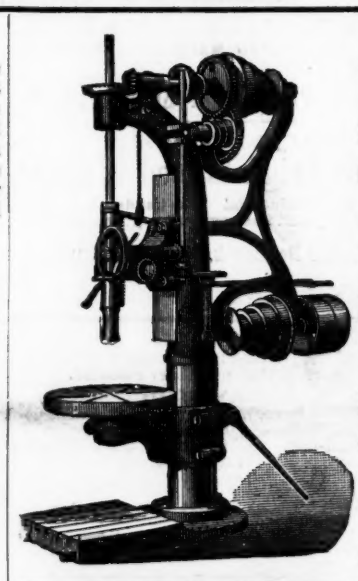

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